Agenda Item 48

TESTIMONY

2:00 PM TIME CERTAIN

OPPOSE APPEAL

HEMPSTALK FESTIVAL APPEAL

AGAINST PORTLAND PARKS & REC DENIAL OF PERMIT APPLICATION

IF YOU WISH TO SPEAK TO CITY COUNCIL, **PRINT** YOUR NAME, ADDRESS, AND EMAIL.

NAME (print)	ADDRESS AND ZIP CODE	Email
✓ P.J. MULCAHY	6722 SW B. THUSDALE HWY	TOPJMULCAHY@aol.com
C.R. WILLIAMS	2088 N.W. CHADBURY 97006	WILLIAMSCH@ATT.COM
~~JOE STALL~~	OPPS	
✓ BARRY JOE STULL	10852 SE STARK ST. #5 Port 97216	cannabisboo@yahoo.com
✓ Eric Loitz	PO Box 52 Wilsonville, OR 97070	hempforvictory4life@gmail.com
✓ Charles Johnson		
✓ David	121 SW salmon suite 1100	

Date 01-09-14

Agenda Item 48 | TESTIMONY | 2:00 PM TIME CERTAIN

SUPPORT APPEAL

HEMPSTALK FESTIVAL APPEAL

AGAINST PORTLAND PARKS & REC DENIAL OF PERMIT APPLICATION

IF YOU WISH TO SPEAK TO CITY COUNCIL, **PRINT** YOUR NAME, ADDRESS, AND EMAIL.

NAME (print)	ADDRESS AND ZIP CODE	Email
Spoke earlier ✓ Michael Bachara	1103 SW Ivory Loop Gresham 97080	webmaster@hempstalk.org
✓ LARRY R. KIRK	6704 S.E. MAY ST. PORT. OR. 97222	LARRY_KIRK@HOTMAIL.COM
✓ Reynold Engberg	14633 SE Kingston ave Portland or 97267	4x44fun@gmail.com
✓ Willian Stovall	755 SE Hogan RD. APT 22 Gresham OR 97080	Stovall_Allen@yahoo.com
✓ PAUL (TWEEDY) ARMSTRONG	16071 NW Belt Rd YAMHILL OR 97148	TWEEDY102001@yahoo.com
✓ Nickie Gates	6520 NE Broadway #22 PDX OR 97213	———
✓ Catherine Mitchell	14471540 Teal Blvd #73C Beaverton, OR 97006	———
✓ Christopher Abrahamsen	4611 SE Brookside DR #69 Milwaukie, OR 97222	ChrisonaGoat22@Gmail.com
✓ Jordynn Jimenez	5125 SW Scholls Ferry RD 97225	
✓ Kyle Purdy	1634 SE Hawthorne blvd Portland, OR 97214	

Date 01-09-14

Agenda Item 48

TESTIMONY

2:00 PM TIME CERTAIN

SUPPORT APPEAL

HEMPSTALK FESTIVAL APPEAL

AGAINST PORTLAND PARKS & REC DENIAL OF PERMIT APPLICATION

IF YOU WISH TO SPEAK TO CITY COUNCIL, **PRINT** YOUR NAME, ADDRESS, AND EMAIL.

NAME (print)	ADDRESS AND ZIP CODE	Email
✓ Dustin W Woolsey		Dwoolsey72@gmail
✓ Lightning	—	—
✓ Steven S. Wessing	3246 NE 79th Ave 97213	
✓ Joe Walsh	—	
✓ Michael J Billingsley	—	michael6568@gmail.com

Date 01-09-14

January 9, 2014

The Hempstalk Festival held in 2013 at the Kelley Point Park impacted the business parks in and around the immediate area.

CBRE manages over 4.5 million square feet of industrial space within one mile of the Kelley Point Park. Each year, when the Hempstalk Festival is held, the owner of the Kelley Point Business Park has to hire additional security to keep unwanted attendees from parking all over the lots.

There is not, and in past years was not, enough parking for the estimated 10,000 attendees to the festival over the weekend. The attendees parked in the Rivergate Corporate Center parking lots and the vacant land across the street. The attendees left trash and debris all over the parking lots. The owners and tenants of the park have to bear the cost of the trash removal and any damage repairs.

In addition to the cost to remove the trash and debris left behind, unauthorized parking of personal vehicles in the parking lots posed a traffic hazard for the many truck drivers bringing their loads to and from the business parks.

In summary, my clients that own the neighboring business parks strongly recommend that Portland City Council does not permit the Hempstalk Festival to return to Kelley Point Park.

Kimberly Fuhrer, CPM, CCIM

Senior Real Estate Manager
CBRE | Asset Services
1300 SW 5th Ave. Suite 3000 | Portland, OR 97201
T 503 221 4807 | F 503 221 4873

500 Broadway Street, Suite 360 Vancouver, WA 98660

T 360 694 9023 C 503 519 7740

Licensed in Oregon and Washington
kimberly.fuhrer@cbre.com | www.cbre.com

Moore-Love, Karla

From: Bradley Steinman [bradley@steinmankucirek.com]
Sent: Thursday, January 09, 2014 12:23 PM
To: Moore-Love, Karla
Subject: Attached Hempstalk 2014 Appellant Files
Attachments: Hempstalk2014-Appeal-Log-Final.pdf; 2014SteinHempstalkAppeal.pdf; Hempstalk 2014 Speech.pdf; Bonnie King-Salem News.pdf

Karla,

Thank you again for your help with all of this. Attached to this letter I am enclosing my testimony for today (which includes a written request for postponement).

I'm also attaching a few pdf docs containing our most relevant available evidence.

Very truly yours,

Bradley

STEINMAN KUCIREK LLC

Bradley M. Steinman
Attorney & Counselor at Law
www.steinmankucirek.com

Cell: (847) 917-9673
Bradley@SteinmanKucirek.com

NOTICE TO RECIPIENT: The contents of this e-mail may contain information that is privileged. If you are not the intended recipient of this e-mail, you are prohibited from sharing, copying, or otherwise using or disclosing its contents. If you have received this e-mail in error, please notify the sender immediately by reply e-mail and permanently delete this e-mail and any attachments without reading, forwarding, or saving them.

REED-USA, INC.
955 N. Columbia Blvd.
Bldg. A
Portland, OR 97217
Tel. 503-735-0003
Fax. 503-735-0306

AUDITOR 01/09/14 PM 1:23

January 8, 2014

Attn: **City Council Members**
To: **City of Portland**

Re: **Hempstalk 2013 & 2014**

Via: **E-Mail Michael Bachara [a1hosting@gmail.com]**

Dear Mr. Bachara,

This letter is written in support of Hempstalk 2014's efforts to secure a permit for an event in Waterfront Park. Reed - USA provided staging services for the event this group produced in Kelly Point Park in 2013.

I personally dealt with Mr. Bachara and while I secured a signature upon delivery of equipment to the site, I must say that our business was the type I prefer, a handshake. The experience was a very satisfactory one, their budget limitations were offset by their ability to deliver a dedicated group of volunteers who worked in the rain to erect our stage equipment.

As we are the "first to come, and the last to leave" and our business activities were such that I personally drove our delivery truck I am able to say that I was again impressed by condition of the site and the crew still toiling with the clean up as we drove away. The park was certainly as clean as the day we initially did the advance.

Additionally, speaking as a citizen, the message of their event deserves a proper public venue.

Sincerely,

R. A. Reed
President

Hempstalk 2014
1/8/14

AUDITOR 01/09/14 PM 1:29

Hi Michael,

We recently spent time reviewing the 2013 Hempstalk event with regard to the adequacy of sanitation on site for its vendors and attendants. As the leading supplier of Portable Restrooms in the United States, as well as the provider of the sanitation equipment at this particular event, we take pride in furnishing our customers with the correct amount of facilities along with the servicing of them to maintain a high quality for everyone who will use our products.

We delivered all of the equipment on the Friday prior to the event. Services were performed on Saturday and Sunday of the event and pick up was completed on the following Monday. The service technicians and operations manager who were on site noted average usage for an event – 25% capacity of the tanks, easy clean up, no large mess in any of the restrooms and overall in great condition. We would make the exact recommendation for 2014 as we provided in 2013 if the amount of attendants remained similar.

Please let us know if we can provide any additional feedback on this matter.

Thank you,

Amora McBride
Account Manager
United Site Services
12215 SE HWY 212
Clackamas, OR 97015
Office: 503.303.1378
Cell: 503.849.5977
Fax: 503.656.0131
E-Mail: Amora.Mcbride@unitedsiteservices.com

www.unitedsiteservices.com

Service You Can Trust

AUDITOR 01/09/14 PM 1:29

Michael,

Hi. Yes, we have the Hemp Festival inspection reports on file still in our office. However, after speaking with my Supervisor, Christie Sweitz, I was told the correct protocol for requesting an inspection report for a person other than the food vendor, is to ask in writing for a copy. This may be in the form of an email requesting all Temporary Restaurant Inspection Reports for Hemp Fest 2013. Send the email to Christie Sweitz at: christie.a.sweitz@multco.us. I am not sure the turn around time for the request, it may take a day or two.

Happy New Year!,

Sombra

Sombra Forrest,R.S.
Lead Environmental Health Specialist
Temporary Restaurant Program
Multnomah County Health Department
847 NE 19th Avenue, Suite 350
Portland, Oregon 97232

Main (503) 988-3400
Direct (503) 988-3400 ext. 22233
Cell (971) 253-9401
Fax (503) 988-5844

My name is Michael Bachara, I am one of the event organizers for the Portland Hempstalk Festival. I have been working with Cary Coker with Portland Parks and Recreation on our festival since 2008.

When we first submit an application, after Cary's initial approval, we begin obtaining sign-offs from various departments within the city. I take every division seriously.

Every year we need sign offs from the Fire Marshall. Michelle Scofield, Portland's Fire Marshall, is familiar with our event. Every year we are in compliance with their rules.

Sombra Forrest is the Health inspector we deal with for our food handlers permits. They inspect every year, as they did this year. We have asked for their logs and are proud to say NONE of our food vendors were shut down. They all are in compliance.

Bethany Davisson is in charge of the Sustainability Program at PSU. Every year we obtain 50 Recycling Stations to be placed throughout the park, it is required for a sign-off. We also work with Kelly Johnson at OregonLive. This year they provided us with 70 OregonLive corrugated trash boxes.

Bathrooms and hand washing stations were provided by Amora McBride and United Site Services. She has submitted testimony to the fact that the bathrooms were periodically cleaned and an adequate number were ordered. We have asked for their logs to be presented in his case.

In late July, we had a meeting with Shawn Rodgers, Cary Coker, Lt. Friedman , Matthew Machado of PBOT and several others to address their concerns. I began working with Matthew Machado on four Virtual Message Boards (VMS). The VMS Boards were contracted by American Barricade and were stationed along Marine Dr. The VMS boards read:

No Parking Marine Dr - Parking Expo Center - $2 Shuttles

Ken Barton the Parking Manager at Portland Expo Center allowed us to use their 2200 car parking lot and we had a team of buses from Cascade Student Union to shuttle event goers to the festival. They did an outstanding job.

We secured American Medical Response (AMR) to stay at our event for the duration and had contracted with them, if one ambulance left another was to take its place. We can obtain their log for the record.

We hired Oasis Fence to provide barricades and fencing for crowd management all the way to the entrance of the park. It was extensive.

We hired Portland Dumpster Rental to provide a 40 yard Box for garbage and one 10 yard box for cardboard. We needed another 30 yard Box, which they provided.

Hundreds of volunteers participated in our event . In many ways we were successful. Waterfront Park will alleviate many issues addressed by Portland Parks and Recreation.

Michael Bachara - Hempstalk Core Staff

STRAIGHT BILL OF LADING — SHORT FORM

ORIGINAL — NOT NEGOTIABLE

CARRIER: Carrier's No.

From RECEIVED, subject to the classifications and tariffs in effect on the date of the issue of this Bill of Lading.

Shipper's No. 01438

INTERNATIONAL PAPER

Beaverton Container Plant

AUDITOR 01/09/14 PM 1:29

DATE 20

CONSIGNED TO Hempstock (Mail or street address of consignee — For purposes of notification only)

DESTINATION (STATE OF) (COUNTY)

ROUTE

DELIVERING CARRIER CAR OR VEHICLE INITIALS NO.

(SAME AS ABOVE UNLESS INDICATED)

SOLD TO DR. LIVE

ADDRESS

CITY

the property described below, in apparent good order, except as noted (contents and condition of contents of packages unknown) marked, consigned, and destined as indicated below, which said carrier (the word carrier being understood throughout this contract, as meaning any person or corporation in possession of the property under the contract) agrees to carry to its usual place of delivery at said destination, if on its route, otherwise to deliver to another carrier on the route to said destination. It is mutually agreed as to each carrier of all or any of said property over all or any portion of said route to destination, and as to each party at any time interested in all or any of said property, that every service to be performed hereunder shall be subject to all the terms and conditions of the Uniform Domestic Straight Bill of Lading set forth (1) in Uniform Freight Classification in effect on the date hereof, if this is a rail or a rail water shipment, or (2) in the applicable motor carrier classification or tariff if this is a motor carrier shipment.

Shipper hereby certifies that he is familiar with all the terms and conditions of the said bill of lading, including those on the back thereof, set forth in the classification or tariff which governs the transportation of this shipment and the said terms and conditions are hereby agreed to by the shipper and accepted for himself and his assigns.

NO. PACKAGES	DESCRIPTION	WEIGHT	Class or Rate	Ck. Col.
	Bdls. Fibreboard Boxes, Corrugated, K.D. Flat			
70	Bdls, Rolls, Skids, Loose — Pulpboard, N.O.I.B.N. Fibre Contents Consisting of Not Less Than 80% Wood Pulp, Waste Paper, or Straw Pulp. (Not Corrugated)	100#		
	Bdls. Rkgs. — Fibreboard Boxes, Other Than Corrugated, K.D. Flat			
	Bales Scrap Paper			
PALLETS	/ OUT IN			

† The fibre boxes used for this shipment conform to the specifications set forth in the boxmaker's certificate thereon, and all other requirements of Consolidated Freight Classification.

† Shipper's imprint in lieu of stamp not a part of bill of lading approved by the Interstate Commerce Commission.

*If the shipment moves between two ports by a carrier by water, the law requires that the bill of lading shall state whether it is carrier's or shipper's weight. NOTE Where the rate is dependent on value, shippers are required to state specifically in writing the agreed or declared value of the property.

The agreed or declared value of the property is hereby specifically stated by the shipper to be not exceeding per

Willamette Industries, Inc.
BEAVERTON CORRUGATED PLANT

Shipper, Per Agent Per

Permanent post office address of shipper: P.O. BOX 666, BEAVERTON, OREGON 97075

Subject to Section 7 of Conditions of applicable bill of lading, if this shipment is to be delivered to the consignee without recourse on the consignor, the consignor shall sign the following statement.

The carrier shall not make delivery of this shipment without payment of freight and all other lawful charges.

(Signature of consignor)

If charges are to be prepaid, write or stamp here, "To be Prepaid."

Received $

to apply in prepayment of the charges on the property described hereon

Agent or Cashier

Per

(the signature here acknowledges only the amount prepaid.)

Charges advanced: $

OUR ORDER NO.	YOUR ORDER NO.	BDLS.	EACH	QUANTITY	P OR C	DESCRIPTION	PRICE M	AMOUNT
				70		TRASH BOXES		

Sq. Ft.

Invoice No.

FREIGHT OR DISCOUNT — RATE

NET SALES

AUDITOR 01/09/14 PM 1:29

Portland Disposal & Recycling, Inc.

7202 NE 42nd Ave
Portland, OR 97218

Invoice

Date	Invoice #
7/31/2013	2583

Bill To

Hempstalk Festival
2712 NE Sandy Blvd
Portland,OR 97232

P.O. No.	Terms
Kelley Point Park	

Serviced	Quantity	Description	Rate	Amount
		Hempstalk Festival Sept. 6th-9th		
9/6/2013		40 yard drop box-up to 7,000lbs	410.00	410.00
9/6/2013		10 yard drop box-Cardboard only	100.00	100.00
			Balance Due	$510.00

**Please return one copy of invoice with your payment.

Phone #	Fax #
503-281-8736	503-281-0480

AUDITOR 01/09/14 PM 1:29

Portland Disposal & Recycling, Inc.

7202 NE 42nd Ave
Portland, OR 97218

Sales Receipt

Date	Sale No.
9/12/2013	18

Sold To
Hempstalk Festival 2712 NE Sandy Blvd Portland,OR 97232

Check No.	Payment Method	Project

Description	Qty	Rate	Amount
Hempstalk Festival			
40 yard drop box-up to 7,000lbs		410.00	410.00
10 yard drop box-Up to 3,000lbs		230.00	230.00
30 yard drop box-up to 6,000lbs		380.00	380.00
Payment by check #3349		-510.00	-510.00
Payment by check #3365		-510.00	-510.00

All work is complete!

Total $0.00

AUDITOR 01/09/14 PM 1:30

January 9, 2014

Steinman Testimony For Appellants

Bradley Steinman, Esq. OSB # 136110
Attorney for Appellants

Waterfront Park is capable of serving as an appropriate venue for Portland Hempstalk. Waterfront Park is close to public transportation, is large enough to accommodate a large public attendance, and will be logistically a much more favorable location than the distant and secluded Kelly Point Park that we staged Hempstalk at the last few years.

Written Request For Postponement Of Appeal

Appellants request a postponement on this agenda item under the provisions of Portland City Code 3.02.040(D)(6). We understand that this written request is filed less than seven days in advance of the scheduled hearing date as is generally required for such requests.

We submit that failing to postpone today's hearing will result in substantial prejudice to the interests of appellants. This is principally based on the unavailability of myself, the appellants' attorney, a key 'consultant' per Section 3.2.040.D.6.d.c. My first meeting with appellants on this matter was on Monday of this week, and my representation of appellants commenced at that time. This was less than four days prior to today's hearing, and is less than the seven day minimum generally required to file a written request to postpone a hearing under the relevant Rules of the Council – 3.020.040 et seq.

Additionally, the unavailability of key witnesses and evidence would be procedurally unfair. There is insufficient time for appellants to review and analyze relevant documents necessary to our investigation and to the fairness of this proceeding.

Although I was able to obtain a response from Mark Ross from PPR today at 10:00am with some 2013 Permit reports I requested, this information is incomplete and will not be fully available in time for the hearing today. Mr. Ross's counterpart from Portland Police Bureau, Peter Simpson, responded promptly to my document request, but informed me that he would be unable to issue any relevant after-event investigation reports that I requested yesterday afternoon, given such a short time frame. Such public records requests typically take 20 days to process or more. Similar problems have been realized with regard to our vendors and contractors from Hempstalk 2013 in our requests from them.

Our inability to secure favorable key witness testimony or appearances is prejudicial in terms of procedural fairness to appellants. Moreover, the substantial amount of negative publicity we have received in light of the PPB's after-event reports misrepresents the content of our event's message and what our event is all about.

We are asking for a postponement for 30 to 60 Days to avoid such unfair substantial prejudice.

AUDITOR 01/09/14 PM 1:30

Give Us the Chance to Work Cooperatively With The City

We are interested in developing an alternative site plan for Hempstalk 2014 in Waterfront Park or an alternative date for the event.

We would like to work with the City to address its concerns. We will continue accept your input, suggestions, and recommendations for putting on Hempstalk 2014 in Waterfront Park. We hired security as instructed. If there was open use of marijuana, this happens at any major event. We are happy to put safeguards into place and work with the City to develop written standard operating procedures for our security and event staff and volunteers to follow for the 10th Annual Hempstalk.

Any PCC 20.08.08 (C) violations were not of a substantial nature, and issues addressed by PPR and the PPB would be resolved in 2014 by allowing Hempstalk 2014 to take place in a different park like Water Front, rather than the secluded and distant site of Kelly Point Park, and at a different date. By applying to Waterfront Park this year, we believed many of the technical and logistical problems we encountered in 2013 at Kelly Point would no longer be relevant or applicable to us.

If there was use of alcohol or other drugs, it was sporadic, not sanctioned by the event, and we specifically asked people not to engage in it. We'll certainly create a plan, and work with the City, Portland Parks and Recreation, the Portland Police Bureau, and our vendors that addresses these concerns and handles the event more adequately in regard to the public safety, public health, traffic, environmental, and other stated concerns of the City. Of course, whether it's a music festival, beer festival, or sporting event, alcohol and illegal drug use by attendees of public events is not unlikely to happen.

We admit that we did have a problem in 2013 with one of the garbage/large bin companies that we used, and a large 30 yard bin was on the park premises after our take-down date. This was a mistake, a failure of one of our vendors that was aware of the ending time and date of our permit, and was able to remove two other large bins expediently. We can switch vendors, and use a new vendor recommended by the City.

Most importantly, we wish to work together with the PPB, PPR, and the City Attorney to develop written standard operating procedures for our 2014 Hempstalk security plan, which our contracted security vendors will all be required to follow. The City's aid in crafting written standard security operating procedures for our 2014 Security Plan that would be sensitive to both first amendment and other legal concerns would be invaluable.

Free Speech Rights Would Be Impermissibly Burdened If Denied A Permit For the Event

Surely an outright denial of our permit application, without extending an opportunity to stage Hempstalk at a reasonable alternative location or at a different time, would substantially burden constitutionally protected first amendment rights.

AUDITOR 01/09/14 PM 1:30

Please consider providing us the opportunity to use the time to correct any inadequacies in our application, so that we can protect constitutionally protected free speech and assembly rights from being burdened. Let us provide the City with a new application or request for proposal for Waterfront Park at an alternative site or date, because such a site would not be susceptible to the problems associated with last year's venue, as should be obvious given the information contained within the police reports included in the publicly available records for this appeal. Please grant us the chance to provide reasoned explanations and responses that comply with all PPR policies and concerns.

Let us work together on this event, especially in drafting written standard operating procedures for how to best deal with population control, security, law enforcement, and sensitive constitutionally protected first amendment rights.

We want to strike an appropriate balance with the City, and are asking for its help. Although we are prepared to litigate this matter and appeal it if necessary to vindicate appellants' interests, we would much prefer to collaborate with the City to put on a successful Hempstalk 2014. Please do not deny our permit here today.

Respectfully,

Bradley Steinman, Esq. OSB # 136110
Attorney for Appellants

AUDITOR 01/09/14 PM 1:30

State ● Initiative ○ Referendum Petition Signature Sheet

Petition ID 22

Some circulators for this petition are being paid. It is against the law to sign a petition more than one time.
All white petition sheets are being circulated by volunteers, who are not being paid to gather signatures.

Supersedes existing laws governing cannabis (marijuana); creates commission to regulate cultivation, processing, sale of cannabis

Result of "Yes" Vote: "Yes" vote overrides most existing laws relating to cannabis, except medical marijuana; creates commission to regulate production, processing, sale of cannabis, contract with cannabis retailers.

Result of "No" Vote: "No" vote retains laws classifying cannabis as a controlled substance; prohibiting most sale, possession, manufacture of cannabis; permitting production, possession of cannabis for medical use.

Summary: Currently, cultivation, possession, sale of cannabis are unlawful, excepting regulated production, possession, use of medical marijuana. Measure supersedes state, local laws relating to cannabis (marijuana), except medical marijuana and driving under the influence laws. Prohibits regulation of "hemp" (defined). Creates commission to license cannabis cultivation, processing by qualified persons; commission sets price, purchases entire crop. Commission sells cannabis at cost to pharmacies, medical research facilities; for profit at set retail price to qualified adults. Licensed retailers receive 15 percent of gross sales. Proceeds fund commission, Attorney General's enforcement of measure's criminal provisions. Ninety percent of profit goes to state general fund, remainder as designated. Attorney General must "vigorously defend" measure, any person prosecuted for licensed activities, propose federal/international law consistent with measure. Other provisions.

Chief Petitioners

Douglas Paul Stanford
4720 NE Davis St
Portland OR 97213

William N Appel
8025 SE Reedway
Portland OR 97206

Michael Bachara
1103 SW Ivory Lp
Gresham OR 97080

Return petition sheets to:

Oregon Cannabis Tax Act
2712 NE Sandy Blvd Portland OR 97232
503-235-4606 1-877-630-9333 www.hemp.org

Text is available upon request from Chief Petitioners

Instructions for Signers

1 Only active Oregon voters may sign the petition. Sign your full name, as you did when you registered to vote.
2 Fill in the date you signed the petition, your printed name and residence address in the spaces provided. Only you may complete your optional information.
3 Use a pen when signing the petition.
4 **It is against the law for signers to:**
→ Sign another person's name under any circumstances.
→ Sign a petition more than one time.
→ Sign a petition when you are not qualified to sign it.

To the Secretary of State of Oregon: I request this petition be submitted to the people of Oregon for their approval or rejection at the November 4, 2014, General Election. A full and correct copy of the text was available for my review and I have not previously signed a signature sheet for this petition.

Signature	Date Signed mm/dd/yy	
Print Name	Residence Address street, city, zip code	Sheet Number

AUDITOR 01/03/14 PM 1:30

Petition Signature Sheet

Petition ID 21

Some circulators for this petition are being paid. It is against the law to sign a petition more than one time.
All white petition sheets are being circulated by volunteers, who are not being paid to gather signatures.

Amends Constitution: Permits adult marijuana use, possession, production, except actions endangering children, public safety; state may regulate

Result of "Yes" Vote: "Yes" vote amends constitution, permits private, personal use, possession or production of cannabis by adults, unless endangers minors or public safety; permits state regulation, taxation.

Result of "No" Vote: "No" vote retains laws prohibiting possession, manufacture, delivery of cannabis, except when permitted under the Oregon Medical Marijuana Act to treat a "debilitating medical condition."

Summary: Under current law, possession, manufacture, and delivery of more than one ounce of cannabis (marijuana), and possession or delivery of less than an ounce within 1,000 feet of a school, are criminal offenses; possession of less than one ounce, or delivery of less than five grams, of cannabis is a violation; Oregon Medical Marijuana Act regulates use, possession, cultivation of specified amounts of cannabis for treatment of a "debilitating medical condition" (defined). Measure amends Oregon Constitution to make criminal laws, sanctions, civil forfeiture laws inapplicable to private, personal use, possession or production of cannabis/ any products of cannabis, by a person aged 21 or older, unless endangers minors or public safety. Permits state regulation reasonably defining, limiting, regulating use, possession, production, sale, taxation of cannabis.

Chief Petitioners

Douglas Paul Stanford
4720 NE Davis St
Portland OR 97213

William N Appel
8025 SE Reedway
Portland OR 97206

Michael Bachara
1103 SW Ivory Lp
Gresham OR 97080

Return petition sheets to:
Help End Marijuana Prohibition in Oregon
2712 NE Sandy Blvd Portland OR 97232
503-235-4606 1-877-630-9333 www.hemp.org

Text is available upon request from Chief Petitioners

Instructions for Signers

1 Only active Oregon voters may sign the petition. Sign your full name, as you did when you registered to vote.
2 Fill in the date you signed the petition, your printed name and residence address in the spaces provided. Only you may complete your optional information.
3 Use a pen when signing the petition.
4 **It is against the law for signers to:**
→ Sign another person's name under any circumstances.
→ Sign a petition more than one time.
→ Sign a petition when you are not qualified to sign it.

To the Secretary of State of Oregon: I request this petition be submitted to the people of Oregon for their approval or rejection at the November 4, 2014, General Election. A full and correct copy of the text was available for my review and I have not previously signed a signature sheet for this petition.

Signature _____ Date Signed mm/dd/yy _____

Print Name _____ Residence Address street, city, zip code _____ Sheet Number _____

AUDITOR 01/03/14 PM 1:30

Salem-News.com

January 9, 2014

To Whom It May Concern:

Salem-News.com has attended Portland Hempstalk every year since 2007. We have had a booth for our news group for the last 5 years, and enjoyed the full spectrum of festival-goers year after year.

At no time have I witnessed any of the allegations put forth by the Portland City Parks bureau.

Parking at Kelley Point Park is a challenge, and festival organizers have done their best with a difficult situation. No other group would have done better.

We were part of the clean up crew on Monday, following the festival. When I arrived at 8 am, I was happily surprised to see crews hard at work, accomplishing their assigned tasks and already closing in on the final stage breakdown and litter walk-throughs.

I walked around the grounds myself, and witnessed the cleanliness of the grounds. It is a well known expectation that the Portland Hempstalk organizers and committees will leave the grounds cleaner than they found them. This was true in 2013.

Having also attended multiple City of Portland events, I concur that this festival poses less of a "risk to public safety and public health" than almost all of the other condoned events.

There were no drunks. There were no fights. There were NO "overdoses". These erroneous accusations feed fear to the naïve, unknowing citizens of Portland. There is no advantage to the people of Oregon to withhold this festival from them.

I witnessed organizers controlling uninvited vendors, who were shown to the door, and watched multiple announcers on stage reminding festival-goers to be respectful park visitors and to follow the laws of Oregon.

The City of Portland should appreciate the influx of tourism dollars. This festival will only continue to grow year over year, and it is a privilege to host this non-violent, educational event. It is a tremendous loss to the City if Hempstalk is hosted elsewhere.

I strongly encourage Portland to reconsider their decision, and welcome Portland Hempstalk onto the 2014 Calendar of Events. We look forward to it.

Sincerely,

Bonnie King
Publisher, Salem-News.com

Salem-News.com
503-864-2100
bonnie@salem-news.com

Moore-Love, Karla

From: Barry Joe Stull [cannabisboo@yahoo.com]

Sent: Thursday, January 09, 2014 1:33 PM

To: Moore-Love, Karla

Subject: Appeal of Hempstalk 2014 Park Permit

Attachments: 1994 CRI Snowbud Art Flyer(1).pdf; 1997 Commercial & Industrial Hemp Pass.pdf; Attached PDF Doocuments1-9-2014.docx; FAH 02-00-1938.pdf; GHI 05-15-1915.pdf; GHS 05-30-42.pdf; Hopkins Kentucky Hemp History Photos.pdf; HXX 00-00-1913.pdf; ITT 00-06-1991.pdf; MAO 00-07-1937.pdf; MRB 06-21-1937(1).pdf; MXX 07-00-1936(1).pdf; OHH 04-03-1926.pdf; POT 00-00-1932.pdf; WPP 04-00-1917.pdf

Dear Karla:
Please find the attached files for forwarding to City Council regarding the January 14, 2014 hearing on the appeal of the 2014 Hempstalk Park Permit denial. The document entitled Attached PDF Documents January 14, 2014 should list the information regarding the articles.
Thank you.
Barry Joe Stull

Attached PDF Documents January 9, 2014 Barry Joe Stull cannabisboo@yahoo.com

1913 USDA Yearbook HXX 00-00-1913

1915 Growing Hemp In America, Scientific American Supplement, May 15, 1915 p 308-09 Facts Relating to Its Culture, Qualities and Preparation by Charles Richards Dodge

1917 Wood-Pulp Paper is Fifty Years Old, Inland Printer, vol. 59, April 1917 p 60

1926 Our Home Hashish Crop; Literary Digest, April 3, 1926 p 64-5

1932 Pharmacology of the Medicinal Agents in Common Use, 1932, Eli Lilly and Company Cannabis and Cannabis Preparations p 49-50

1936 Marihuana, The American Journal of Nursing, July 1936 p 677-78

1937 Marihuana Regulation Bill Passd by House, Oil Paint and Drug Reporter, June 21, 1937 p 1

1937 Marijuana Assassin of Youth ; American Mercury, July 1937 pp 18, 19, 150-53; by H.J. Anslinger, U.S. Commissioner of Narcotics, with Courtney J. Cooper

1938 Flax and Hemp from the Seed to the Loom, Mechanical Engineering, February 1938, p 141-46, FAH 02-00-1938

1943 January 1943 USDA Bulletin No. 1935, Hemp, by B. B. Robinson
HXX 01-00-1943

1951 Photos of hemp processing in History of the Hemp Industry in Kentucky by James Hopkins

1991 It's Time to Reconsider Hemp; Pulp & Paper, June 1991; p 7; Editorial by Jim Young

1994 Cannabis Research Institute Snowbud (Chris Newman) Flyer

1997 Commercial & Industrial Hemp Symposium Delegate Pass February 18 & 19, 1997 Vancouver, British Columbia, Canada

PDXS, Portland, Oregon, Volume 7, Number 14, October 24-November 13, 1997, pp. 3-5
Available at : http://www.marijuanalibrary.org/PDXS_Police_v_fests_102497.html

The Great Book of Hemp, at page 3, documenting Barry Stull as a 1980s researcher:

UPPER FIGURE: WOOD THRUSH (HYLOCICHLA MUSTELINA)
LOWER FIGURE: HERMIT THRUSH (HYLOCICHLA GUTTATA PALLASI)

YEARBOOK

OF THE

UNITED STATES DEPARTMENT OF AGRICULTURE

1913

WASHINGTON
GOVERNMENT PRINTING OFFICE
1914

CONTENTS.

pasture lands and little is saved to haul to the cultivated fields. The manure on the pasture will stimulate the growth of the grasses, however, and increase the "carrying capacity" of the pasture, and if the pastures are put in cultivation later the effects of the manure will be apparent.

The greatest need of the southern soils is barnyard manure, the application of which always increases the yields of the subsequent crops, regardless of the type of the soils to which it is applied. Cotton responds very readily to stable manure, in fact, far more readily than either corn or oats, and this in itself is a great item in favor of live stock, for cotton is and probably always will be the staple crop of the South, and an increased yield per acre means greater profits to the farmer. By raising live stock the soil is improved by the growing of leguminous pasture grasses, of nitrogen-gathering forage crops, by the return of the manure to the land, and by abandoning the one-crop system, which is the worst form of soil robbery.

HEMP.

By LYSTER H. DEWEY,

Botanist in Charge of Fiber-Plant Investigations, Bureau of Plant Industry.

INTRODUCTION.

THE two fiber-producing plants most promising for cultivation in the central United States and most certain to yield satisfactory profits are hemp and flax. The oldest cultivated fiber plant, one for which the conditions in the United States are as favorable as anywhere in the world, one which properly handled improves the land, and which yields one of the strongest and most durable fibers of commerce, is hemp. Hemp fiber, formerly the most important material in homespun fabrics, is now most familiar to the purchasing public in this country in the strong gray tying twines one-sixteenth to one-fourth inch in diameter, known by the trade name "commercial twines."

NAME.

The name "hemp" belongs primarily to the plant *Cannabis sativa.* (Pl. XL, fig. 1.) It has long been used to designate also the long fiber obtained from the hemp plant. (Pl. XL, fig. 4.) Hemp fiber, being one of the earliest and best-known textile fibers and until recent times the most widely used of its class, has been regarded as the typical representative of long fibers. Unfortunately, its name also came to be regarded as a kind of common name for all long fibers, until one now finds in the market quotations "Manila hemp" for abacá, "sisal hemp" for sisal and henequen, "Mauritius hemp" for Furcraea fiber, "New Zealand hemp" for phormium, "Sunn hemp" for Crotalaria fiber, and "India hemp" for jute. All of these fibers in appearance and in economic properties are unlike true hemp, while the name is never applied to flax, which is more nearly like hemp than any other commercial fiber.

The true hemp is known in different languages by the following names: *Cannabis,* Latin; *chanvre,* French; *cañamo,*

Spanish; *cañamo,* Portuguese; *canapa,* Italian; *canep,* Albanian; *konopli,* Russian; *konopj* and *penek,* Polish; *kemp,* Belgian; *hanf,* German; *hennup,* Dutch; *hamp,* Swedish; *hampa,* Danish; *kenevir,* Bulgarian; *ta-ma, si-ma,* and *tse-ma,* Chinese; *asa,* Japanese; *nasha,* Turkish; *kanabira,* Syrian; *kannab,* Arabic.

IMPORTANCE OF HEMP.

Hemp was formerly the most important long fiber, and it is now used more extensively than any other soft fiber except jute. From 10,000 to 15,000 tons are used in the United States every year. The approximate amount consumed in American spinning mills is indicated by the following table, showing the average annual importations [1] and estimates of average domestic production of hemp fiber for 35 years:

Average annual imports and estimates of average annual production of hemp fiber in 5-year periods from 1876 to 1910, inclusive, and *from 1911 to 1913, inclusive.*

Years.	Imports.	Production in United States.	Total.
	Tons.	*Tons.*	*Tons.*
1876 to 1880.....	459	7,396	7,855
1881 to 1885.....	5,393	5,421	10,814
1886 to 1890.....	10,427	8,270	18,697
1891 to 1895.....	4,962	5,631	10,593
1896 to 1900.....	4,985	5,177	10,162
1901 to 1905.....	4,577	6,175	10,752
1906 to 1910.....	6,375	5,150	11,525
1911 to 1913.....	5,982	5,100	11,082

There are no statistics available, such as may be found for wheat, corn, or cotton, showing with certainty the acreage and production of hemp in this country. The estimates of production in the foregoing table are based on the returns of the Commissioner of Agriculture of Kentucky for earlier years with amounts added to cover the production in other States, and on estimates of hemp dealers for more recent years. While these figures can not be regarded as accurate statistics, and they are probably below rather than above the actual production, especially in the earlier years,

[1] Computed from reports of the Bureau of Navigation and Commerce, U. S. Treasury Department, and Bureau of Statistics, Department of Commerce.

they indicate a condition well recognized by all connected with the industry. The consumption of hemp fiber has a slight tendency to increase, but the increase is made up through increased importations, while the domestic production shows a tendency toward reduction.

PRODUCTION IN UNITED STATES DECLINING.

This falling off in domestic production has been due primarily to the increasing difficulty in securing sufficient labor to take care of the crop; secondarily, to the lack of development of labor-saving machinery as compared with the machinery for handling other crops and to the increasing profits in raising stock, tobacco, and corn, which have largely taken the attention of farmers in hemp-growing regions.

The work of retting, breaking, and preparing the fiber for market requires a special knowledge, different from that for handling grain crops, and a skill best acquired by experience. These factors have been more important than all others in restricting the industry to the bluegrass region of Kentucky, where the plantation owners as well as the farm laborers are familiar with every step in handling the crop and producing the fiber.

An important factor, tending to restrict the use of hemp, has been the rapidly increasing use of other fibers, especially jute, in the manufacture of materials formerly made of hemp. Factory-made woven goods of cotton or wool, more easily spun by machinery, have replaced the hempen "homespun" for clothing; wire ropes, stronger, lighter, and more rigid, have taken its place in standing rigging for ships; abacá (Manila hemp), lighter and more durable in salt water, has superseded it for towing hawsers and hoisting ropes; while jute, inferior in strength and durability, and with only the element of cheapness in its favor, is usurping the legitimate place of hemp in carpet warps, so-called "hemp carpets," twines, and for many purposes where the strength and durability of hemp are desired.

The introduction of machinery for harvesting hemp and also for preparing the fiber, together with the higher prices paid for hemp during the past three years, has aroused an interest in the industry, and many experiments are being tried with a view to the cultivation of the crop in new areas.

BOTANICAL STUDY OF HEMP

THE PLANT.

The hemp plant, *Cannabis sativa* L.,[1] is an annual, growing each year from the seed. It has a rigid, herbaceous stalk, attaining a height of 1 to 5 meters (3 to 16 feet), obtusely 4-cornered, more or less fluted or channeled, and with well-marked nodes at intervals of 10 to 50 centimeters (4 to 20 inches). When not crowded it has numerous spreading branches, and the central stalk attains a thickness of 3 to 6 centimeters (1 to 2 inches), with a rough bark near the base. If crowded, as when sown broadcast for fiber, the stalks are without branches or foliage except at the top, and the smooth fluted stems are 6 to 20 millimeters ($\frac{1}{4}$ to $\frac{3}{4}$ inch) in diameter. The leaves, opposite, except near the top or on the shortened branches, appearing fascicled, are palmately compound and composed of 5 to 11—usually 7—leaflets. (Pl. XLI, fig. 1.) The leaflets are dark green, lighter below, lanceolate, pointed at both ends, serrate, 5 to 15 centimeters (2 to 6 inches) long, and 1 to 2 centimeters ($\frac{3}{8}$ to $\frac{3}{4}$ inch) wide. Hemp is dicecious, the staminate or pollen-bearing flowers and the pistillate or seed-producing flowers being borne on separate plants. The staminate flowers (Pl. XL, fig. 2) are borne in small axillary panicles, and consist of five greenish yellow or purplish sepals opening wide at maturity and disclosing five stamens which discharge abundant yellow pollen. The pistillate flowers (Pl. XL, fig. 3) are stemless and solitary in the axils of the small leaves near the ends of the branches, often crowded so as to appear like a thick spike. The pistillate flower is inconspicuous, consisting of a thin, entire, green calyx, pointed, with a slit at one side, but remaining nearly closed over the ovary and merely permitting the two small stigmas to protrude at the apex. The ovary is one seeded, developing into a smooth, compressed or nearly spherical achene (the "seed"), 2.5 to 4 millimeters ($\frac{1}{10}$ to $\frac{3}{16}$ inch) thick and 3 to 6 millimeters ($\frac{1}{8}$ to $\frac{1}{4}$ inch) long, from dark gray to light brown in color and mottled (Pl. XLI, fig. 2). The seeds cleaned for market nearly always include some still covered with the green, gummy calyx. The seeds vary in weight from 0.008 to 0.027 gram, the dark-colored seeds being generally much heavier than the light-colored seeds of the same sample. The light-colored seeds are often imperfectly developed. Dark-colored and distinctly mottled seeds are generally preferred.

The staminate plants are often called the flowering hemp, since the pistillate flowers are rarely observed. The staminate plants die after the pollen is shed, but the pistillate plants remain alive and green two months later, or until the seeds are fully developed.

[1] Linnæus. Species Plantarum, ed. 1, 1027, 1753.
Dioscorides. Medica Materia, libri sex, p. 147, 1537.
Synonyms: *Cannabis erratica paludosa* Anders. Lobel. Stirpium Historia, 284, 1576.
Cannabis indica Lamarck. Encyclopaedia, 1: 695, 1788.
Cannabis macrosperma Stokes. Bot. Mat. Med., IV, 539, 1812.
Cannabis chinensis Delile. Ind. Sem. Hort. Monst. in Ann. Sci. Nat. Bot., 12: 365, 1849.
Cannabis gigantea Delile. L. Vilmorin. Rev. Hort., 5: s. 3, 109, 1851.

THE STALK.

The hemp stalk is hollow, and in the best fiber-producing types the hollow space occupies at least one-half the diameter. The hollow space is widest, or the surrounding shell thinnest, about midway between the base and the top of the plant. The woody shell is thickened at each node, dividing the hollow space into a series of partly separated compartments. (Pl. XLI, fig. 4.) If the stalk is cut crosswise a layer of pith, or thin-walled tissue, is found next to the hollow center, and outside of this a layer of wood composed of hard, thick-walled cells. This layer, which forms the "hurds," is a very thin shell in the best fiber-producing varieties. It extends clear across the stem below the lowest node, and in large, coarse stalks grown in the open it is much thicker and the central hollow relatively smaller. Outside of the hard woody portion is the soft cambium, or growing tissue, the cells of which develop into the wood on the inside, or into the bast and bark on the outside. It is chiefly through this cambium layer that the fiber-bearing bast splits away from the wood in the processes of retting and breaking. Outside of the cambium is the inner bark, or bast, comprising short, thin-walled cells filled with chlorophyll, giving it a green color, and long thick-walled cells, making the bast fibers. These bast fibers are of two kinds, the smaller ones (secondary bast fibers) toward the inner portion making up rather short, fine fibers, many of which adhere to the wood or hurds when the hemp is broken, and the coarser ones (primary bast fibers) toward the outer part, extending nearly throughout the length of the stalk. Outside of the primary bast fiber is a continuation of the thin-walled chlorophyll-bearing cells free from fiber, and surrounding all is the thin epidermis.

THE FIBER.

The hemp fiber of commerce is composed of the primary bast fibers, with some adherent bark and also some secondary bast fiber. The bast fibers consist of numerous long, overlapping, thick-walled cells with long, tapering ends. The individual cells, almost too small to be seen by the unaided eye, are 0.015 to 0.05 millimeter ($\frac{3}{1000}$ to $\frac{12}{1000}$ inch) in diameter, and 5 to 55 millimeters ($\frac{3}{16}$ to $2\frac{1}{8}$ inches) long. Some of the bast fibers extend through the length of the stalk, but some are branched, and some terminate at each node. They are weakest at the nodes.

RELATIONSHIPS.

The hemp plant belongs to the mulberry family, Moraceæ, which includes the mulberry, the Osage orange, the paper mulberry, from the bast of which the tapa of the South Sea Islands is made, and the hop, which contains a strong bast fiber. Hemp is closely related to the nettle family, which includes ramie, an important fiber-producing plant of Asia, and several species of nettles having strong bast fibers.

The genus Cannabis is generally regarded by botanists as monotypic, and the one species *Cannabis sativa* is now held to include the half dozen forms which have been described under different names (see footnote, p. 286) and which are cultivated for different purposes. The foregoing description refers especially to the forms cultivated for the production of fiber.

HISTORY.

EARLY CULTIVATION IN CHINA.

Hemp was probably the earliest plant cultivated for the production of a textile fiber. The "Lu Shi," a Chinese work of the Sung dynasty, about 500 A. D., contains a statement that the Emperor Shen Nung, in the twenty-eighth century B. C., first taught the people of China to cultivate "ma" (hemp) for making hempen cloth. The name *ma* (fig. 17) occurring in the earliest Chinese writings designated a plant of two forms, male and female, used primarily for fiber. Later the seeds of this plant were used for food.[1] The definite statement regarding the staminate and pistillate forms eliminates other fiber plants included in later times under the Chinese name *ma*. The Chinese have cultivated the plant for the production of fiber and for the seeds, which were used for food and later for oil, while in some places the stalks are used for fuel, but there seems to be no record that they have used the plant for the production of the narcotic drugs bhang, charas, and ganga. The production and use of these drugs were developed farther west.

FIG. 17.—Chinese character *ma*, the earliest name for hemp.

CULTIVATION FOR NARCOTIC DRUGS.

The use of hemp in medicine and for the production of the narcotic drug Indian hemp, or cannabis, is of interest in this paper only because of its bearing on the origin and development of different forms of the plant. The origin of this use is not definitely known, but the weight of evidence

[1] Bretschneider, E. Botanicum Sinicum, in Journal of the North China Branch of the Royal Asiatic Society, n. s., v. 25, p. 203, 1893, Shanghai.

seems to indicate central Asia or Persia and a date many centuries later than its first cultivation for fiber. The name *bhanga* occurs in the Sanskrit "Atharvavéda" (about 1400 B. C.), but the first mention of it as a medicine seems to be in the work of Susruta (before the eighth century A. D.), while in the tenth century A. D. its intoxicating nature seems to have been known, and the name "indraçana" (Indra's food) first appears in literature.[1] A further evidence that hemp, for the production of fiber as well as the drug, has been distributed from central Asia or Persia is found in the common origin of the names used. The Sanskrit names "bhanga" and "gangika," slightly modified to "bhang" and "ganja," are still applied to the drugs, and the roots of these words, "ang" and "an," recur in the names of hemp in all of the Indo-European and modern Semitic languages, as bhang, ganja, hanf, hamp, hemp, chanvre, cañamo, kannab, cannabis.[2]

HEMP IN INDIA.

Northern India has been regarded by some writers as the home of the hemp plant, but it seems to have been unknown in any form in India before the eighth century, and it is now thought to have been introduced there first as a fiber plant. It is still cultivated to a limited extent for fiber in Kashmir and in the cool, moist valleys of the Himalayas, but in the warmer plains regions it is grown almost exclusively for the production of the drugs.[3]

Hemp was not known to the Hebrews nor to the ancient Egyptians, but in medieval times it was introduced into North Africa, where it has been cultivated only for the drug. It is known in Morocco as "kif," and a small form, 1 to 3 feet high, cultivated there has been described as a distinct variety, *Cannabis sativa kif*.[4]

INTRODUCTION INTO EUROPE.

According to Herodotus (about 450 B. C.), the Thracians and Scythians, beyond the Caspian Sea, used hemp, and it is probable that the Scythians introduced the plant into Europe in their westward migration, about 1500 B. C.,

[1] Watt, Sir George. Commercial Products of India, p. 251, 1908.
[2] De Candolle, Alphonse. Origin of Cultivated Plants, p. 148, 1886.
[3] Watt, Sir George. Commercial Products of India, p. 253, 1908.
[4] De Candolle, Alphonse. Prodromus, v. 16, pt. 1, p. 31, 1869.

though it seems to have remained almost unknown to the Greeks and Romans until the beginning of the Christian era. The earliest definite record of hemp in Europe is the statement that "Hiero II, King of Syracuse (270 B. C.), bought hemp in Gaul for the cordage of his vessels."[1] From the records of Tragus (1539 A. D.), hemp in the sixteenth century had become widely distributed in Europe. It was cultivated for fiber, and its seeds were cooked with barley and other grains and eaten, though it was found dangerous to eat too much or too frequently. Dioscorides called the plant *Cannabis sativa*, a name it has continued to bear to the present time, and he wrote of its use in "making the stoutest cords" and also of its medicinal properties.[2] Nearly all of the early herbalists and botanical writers of Europe mention hemp, but there is no record of any further introduction of importance in the fiber industry until the last century.

INTRODUCTION OF CHINESE HEMP INTO EUROPE.

In 1846 M. Hébert sent from China to the Museum at Paris some seeds of the "tsing-ma," great hemp, of China. Plants from this seed, grown at Paris by M. L. Vilmorin, attained a height of more than 15 feet, but did not produce seeds. In the same year M. Itier sent from China to M. Delile, of the Garden at Montpellier, France, seeds of a similar kind of hemp. These seeds were distributed in the southern part of France, where the plants not only grew tall, some of them measuring 21 feet, but they also produced mature seeds. M. Delile called this variety *Cannabis chinensis*[3] and the one from the seeds sent by M. Hébert he called *C. gigantea*.[4] These two forms of hemp were regarded as the same by M. L. Vilmorin, who states that they differ very much in habit from the common hemp of Europe, which was shorter and less valuable for fiber production. We are also told that this chanvre de Chine did not appear to be the same as the chanvre de Piedmont,[5] the tall hemp of eastern France and northern Italy, the origin of which has sometimes been referred to this introduction, but this

[1] De Candolle, Alphonse. Origin of Cultivated Plants, p. 148, 1886.
[2] Dioscorides. Medica Materia, li bri sex, p. 147, 1537.
[3] Delile, Raffenau. Index seminum horti botanici Monspelliensis. Ann. Sci. Nat. Bot., v. 12, p. 365, 1849.
[4] Vilmorin, L. Chanvre de Chine. Rev. Hort. 5: s. 3, p. 109, 1851.
[5] Pépin. Sur le chanvre de Chine. Rev. Hort. 1: s. 3, p. 199, 1847.

may have originated in a previous introduction, since *Cannabis chinensis* is mentioned as having been in the Botanical Garden at Vienna in 1827. In the same statement, however, *C. sativa pedemontana* is described as a distinct variety.[1] Particular attention is called to the introduction of this large Chinese hemp into Europe, since it was doubtless from the same source as the best hemp seed now brought from China to the United States.

INTRODUCTION INTO SOUTH AMERICA.

Hemp from Spain was introduced into Chile about 1545.[2] It has been largely grown in that country, but at present its cultivation is confined chiefly to the fertile lands in the valley of the Rio Aconcagua, between Valparaiso and Los Andes, where there are large cordage and twine mills. The fiber is all consumed in these mills.

INTRODUCTION INTO NORTH AMERICA.

Hemp was introduced into New England soon after the Puritan settlements were established, and the fact that it grew "twice so high" as it did in old England was cited as evidence of the superior fertility of the soil of New England.[3] A few years later a writer in Virginia records the statement that "They begin to plant much Hempe and Flax which they find growes well and good."[4] The cultivation of hemp in the New England colonies, while continued for some time in Massachusetts and Connecticut, did not attain as much importance as the cultivation of flax for supplying fiber for household industry. In the South hemp received more attention, especially from the Virginia Legislature, which passed many acts designed to promote the industry, but all in vain.[5]

The cultivation of hemp seems to have been a flourishing industry in Lancaster County, Pa., before the Revolution. An elaborate account of the methods then employed in

[1] De Candolle, Alphonse. Prodromus, v. 16, pt. 1, p. 31, 1869.
[2] Husbands, José D. U. S. Department of Agriculture, Bureau of Plant Industry, Bulletin 153, p. 42, 1909.
[3] Morton, Thomas. New English Canaan, p. 64, 1632. *In* Force, Peter, Tracts and Other Papers, v. 2, 1838.
[4] Virginia, printed for Richard Wodenoth, 1649. *In* Force, Peter, Tracts and Other Papers, v. 2, 1838.
[5] Moore, Brent. A Study of the Past, the Present, and the Possibilities of the Hemp Industry in Kentucky, p. 14, 1905.

growing hemp, written about 1775 by James Wright, of Columbia, Pa.,[1] was recently published as an historical document. The methods described for preparing the land were equal to the best modern practice, but the hemp was pulled by hand instead of cut. Various kinds of machine brakes had been tried, but they had all "given Way to one simple Break of a particular Construction, which was first invented & made Use of in this country." The brief description indicates the common hand brake still in use in Kentucky.

EARLY CULTIVATION IN KENTUCKY.

The first crop of hemp in Kentucky was raised by Mr. Archibald McNeil, near Danville, in 1775.[2] It was found that hemp grew well in the fertile soils of the bluegrass country, and the industry was developed there to a greater extent than it had been in the eastern colonies. While it was discontinued in Massachusetts, Virginia, and Pennsylvania, it has continued in Kentucky to the present time. In the early days of this industry in Kentucky, fiber was produced for the homespun cloth woven by the wives and daughters of the pioneer settlers, and an export trade by way of New Orleans was developed. In 1802 there were two extensive ropewalks in Lexington, Ky., and there was announced "a machine, moved by a horse or a current of water, capable, according to what the inventor said, to break and clean eight thousand weight of hemp per day."[3] Hemp was later extensively used for making cotton-bale covering. Cotton bales were also bound with hemp rope until iron ties were introduced, about 1865. There was a demand for the better grades of hemp for sailcloth and for cordage for the Navy, and the industry was carried on more extensively from 1840 to 1860 than it has been since.

EXTENSION OF THE INDUSTRY TO OTHER STATES.

Hemp was first grown in Missouri about 1835, and in 1840 1,600 tons were produced in that State. Four years later the output had increased to 12,500 tons, and it was thought that Missouri would excel Kentucky in the production of

[1] New Era, Lancaster, Pa., June 24, 1905.

[2] Moore, Brent. A Study of the Past, the Present, and the Possibilities of the Hemp Industry in Kentucky, p. 16, 1905.

[3] Michaux, F. Andre. Travels to the west of the Alleghanies, p. 152, 1805. *In* Thwaites, Early Western Travels, v. 3, p. 200, 1904.

this fiber. With the unsatisfactory methods of cleaning the fiber on hand brakes and the difficulties of transporting the fiber to the eastern markets, hemp proved less profitable than other crops, and the industry was finally abandoned about 1890.

Hemp was first grown at Champaign, Ill., about 1875. A cordage mill was established there for making twines from the fiber, which was prepared in the form of long tow by a large machine brake. The cordage mill burned and the industry was discontinued in 1902 because there was no satisfactory market for the kind of tow produced.

In Nebraska, hemp was first grown at Fremont in 1887 by men from Champaign, Ill. A binder-twine plant was built, but owing to the low price of sisal, more suitable for binder twine, most of the hemp was sold to eastern mills to be used in commercial twines. After experimenting with machine brakes the company brought hand brakes from Kentucky and colored laborers to operate them. The laborers did not stay, and the work was discontinued in 1900. Some of the men who had been connected with the company at Fremont began growing hemp at Havelock, near Lincoln, in 1895. A machine for making long tow, improved somewhat from the one at Champaign, was built. Further improvements were made in the machine and also in the methods of handling the crop, but the industry was discontinued in 1910, owing to the lack of a satisfactory market for the kind of tow produced.

Hemp was first grown on a commercial scale in California at Gridley, in Butte County, by Mr. John Heaney, who had grown it at Champaign and who devised the machine used there for making long tow. Mr. Heaney built a machine with some improvements at Gridley, and after three disastrous inundations from the Feather River moved to Courtland, in the lower Sacramento Valley, where the reclaimed lands are protected by dikes. The work is now being continued at Rio Vista, in Solano County, under more favorable conditions and with a machine still further improved. The hemp fiber produced in California is very strong and is generally lighter in color than that produced in Kentucky.

In 1912 hemp was first cultivated on a commercial scale under irrigation at Lerdo, near Bakersfield, Cal., and a larger acreage was grown there in 1913. The seed for both crops was obtained in Kentucky.

INTRODUCTION OF CHINESE HEMP INTO AMERICA.

In 1857 the first Chinese hemp seed was imported. It met with such favor that some of this seed is said to have brought $10 per quart.[1] Since that time the common hemp of European origin has given place in this country to the larger and better types from China.

GEOGRAPHICAL DISTRIBUTION.

The original home of the hemp plant was in Asia, and the evidence points to central Asia, or the region between the Himalayas and Siberia. Historical evidence must be accepted rather than the collection of wild specimens, for hemp readily becomes naturalized, and it is now found growing without cultivation in all parts of the world where it has been introduced. Hemp is abundant as a wild plant in many localities in western Missouri, Iowa, and in southern Minnesota, and it is often found as a roadside weed throughout the Middle West. De Candolle[2] writes of its origin as follows:

> The species has been found wild, beyond a doubt, south of the Caspian Sea (De Bunge); in Siberia, near the Irtysch; and in the Desert of Kirghiz, beyond Lake Baikal, in Dahuria (Government of Irkutsh). It is found throughout central and southern Russia and south of the Caucasus, but its wild nature here is less certain. I doubt whether it is indigenous in Persia, for the Greeks and Hebrews would have known of it earlier.

Hemp is now cultivated for the production of fiber in China, Manchuria, Japan, northern India, Turkey, Russia, Austria-Hungary, Italy, France, Belgium, Germany, Sweden, Chile, and in the United States. It is grown for the production of the drugs bhang, ganja, kif, marihuana, hasheesh, etc., in the warm, arid, or semiarid climates of India, Persia, Turkey, Algeria, central and southern Africa, and in Mexico, and for the production of seed for oil in China and Manchuria.

In the United States hemp is now cultivated in the bluegrass region of Kentucky within a radius of 50 miles of Lexington; in the region of Waupun, Wis.; in northern Indiana; near Lima, Ohio; and at Lerdo and Rio Vista, Cal. There are numerous small experimental plats in other places.

The principal countries producing hemp fiber for export are Russia, Italy, Hungary, and Roumania. China and Japan produce hemp fiber of excellent quality, but it is nearly all used for home consumption. Hemp is not cultivated for fiber in the Tropics or in any of the warm countries.

The historical distribution of hemp, as nearly as may be traced from the records, and the areas where hemp is now cultivated are indicated in the accompanying map, figure 6.

[1] Moore, Brent. The Hemp Industry in Kentucky, pp. 60–61, 1905.
[2] De Candolle, Alphonse. Origin of Cultivated Plants, p. 148, 1886.

VARIETIES.

Hemp, cultivated for three different products—fiber from the bast, oil from the seeds, and resinous drugs from the flowers and leaves—has developed into three rather distinct types or groups of forms. The extreme, or more typical, forms of each group have been described as different species, but the presence of intergrading forms and the fact that the types do not remain distinct when cultivated under new conditions make it impossible to regard them as valid species.

There are few recognized varieties in either group. Less than 20 varieties of fiber-producing hemp are known, although hemp has been cultivated for more than 40 centuries, or much longer than either cotton or corn, both of which now have hundreds of named varieties.

CHINA.

The original home of the hemp plant was in China, and more varieties are found there than elsewhere. It is cultivated for fiber in nearly all parts of the Chinese Republic, except in the extreme south, and over a wide range of differences in soil and climate with little interchange of seed, thus favoring the development and perpetuation of varietal differences.

The variety called "ta-ma" (great hemp) is cultivated chiefly in the provinces of Chekiang, Kiangsu, and Fukien, south of the Yangtze. In the rich lowland soils, often in rotation with rice, but not irrigated, and with a warmer and longer growing season than in Kentucky, this hemp attains a height of 10 to 15 feet. The seed is dark colored, usually well mottled, small, weighing about 1.2 grams per hundred. The internodes of the main stem are 6 to 10 inches long; the branches long and slender, usually drooping at the ends; the leaves large; and the pistillate flowers in small clusters.

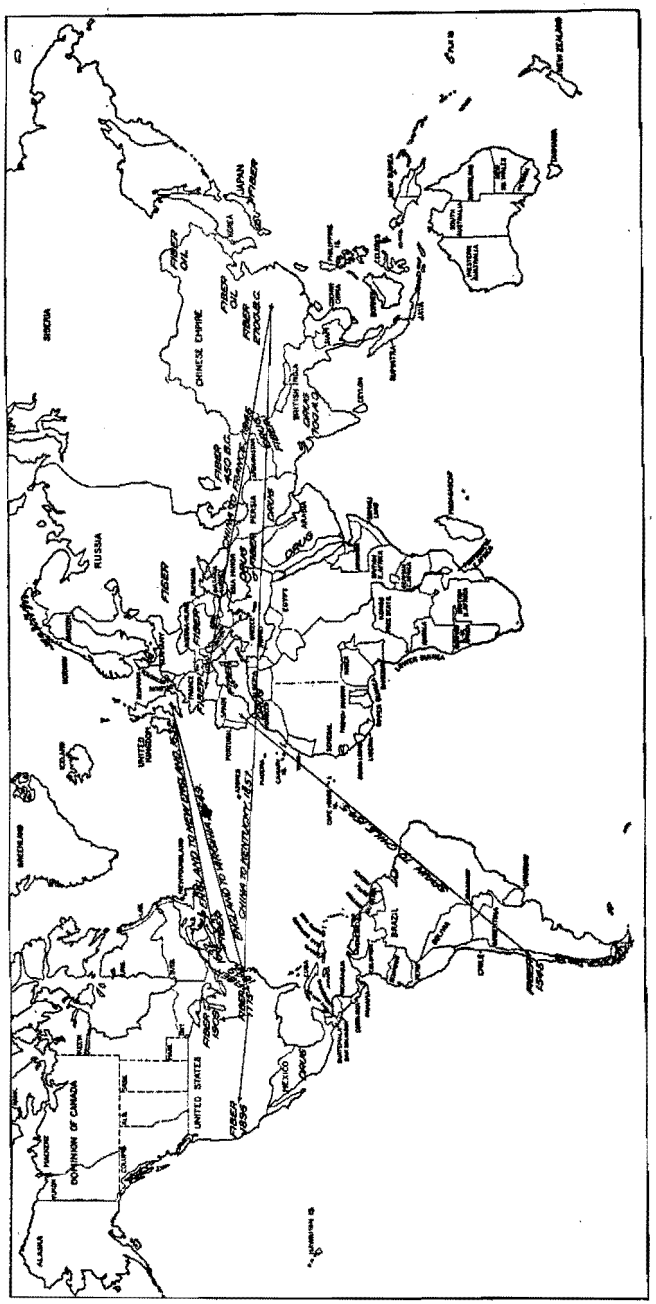


FIG. 18.—Map of the world, showing the location of hemp cultivation for fiber, oil, and drug, with the sources and dates of introduction.

Seed brought from China to Kentucky in recent years is mostly of this variety. When first introduced it is too long in maturing to permit all of the seeds to ripen.

The most important fiber plant of western China is the variety of hemp called "hoa-ma." It is grown in the province of Szechwan and as a winter crop on the plains of Chengtu in that province. It is shorter and more compact in its habit of growth and earlier in maturing than the ta-ma of the lowlands.

A variety called "shan-ma-tse" is cultivated in the mountain valleys in the provinces of Shansi and Chihli, in northern China. Its fiber is regarded as the best in North China, and in some respects as superior to that of ta-ma, though the yield is usually smaller. The plants attain a height of 6 to 9 feet, with a very thin woody shell, short ascending branches, rather small leaves, and larger seeds in larger clusters than those of ta-ma. Imported seed of this variety, grown in a trial plat in Kentucky, produced plants smaller in size and maturing earlier than Kentucky hemp.

In the mountains both north and south of Ichang in central China a variety called "t'ang-ma" (cold hemp) is cultivated primarily for the production of seeds, from which oil is expressed. It is a very robust form, with stalks 6 to 12 feet high and 2 to 4 inches in diameter. These stalks are used for fuel, and occasionally a little fiber is stripped off for domestic use.

In Manchuria two distinct kinds of hemp are cultivated. One, called "hsien-ma," very similar to the shan-ma-tse of northern China, is grown for fiber. It attains a height of 8 to 9 feet, and requires nearly 150 days from seeding to full maturity. The other, called "shem-ma," is grown for oil-seed production. It attains a height of 3 to 5 feet and is ripe with fully matured seeds in less than 100 days. The branches usually remain undeveloped, so that the clusters of seeds are borne in compact heads at the tops of the simple stalks. (Pl. XLII, fig. 1.) It is said that in Manchuria these two forms remain distinct without crossing or producing any intergrading forms.

The Chinese name "ma" (fig. 17), originally applied only to the true hemp (*Cannabis sativa*), is now used as a

general term to designate nearly all textile plants in China.[1] This general use leads to nearly as much confusion among English-speaking people in China as does the unfortunate use of the name hemp as a synonym for fiber in this country. The staminate hemp plant is called "si-ma," and the pistillate plant "tsu-ma." Flax, cultivated to a limited extent in northern China, is called "siao-ma" (small hemp), but this name is also applied to small plants of true hemp. Ramie, cultivated in central and southern China, is "ch'u-ma" or "tsu-ma." China jute, cultivated in central and northern China and in Manchuria and Chosen (Korea), is called "tsing-ma," or "ching-ma," and its fiber, exported from Tientsin, is called "pei-ma." India jute, cultivated in southern China and Taiwan, is called "oi-ma." The name "chih-ma" is also applied in China to sesame, which is not a fiber plant.

JAPAN.

Hemp, called "asa" in the Japanese language, is cultivated chiefly in the provinces or districts of Hiroshima, Tochigi, Shimane, Iwate, and Aidzu, and to a less extent in Hokushu (Hokkaido) in the north and Kiushu in the south. It is cultivated chiefly in the mountain valleys, or in the north on the interior plains, where it is too cool for cotton and rice and where it is drier than on the coastal plain. That grown in Hiroshima, in the south, is tall, with a rather coarse fiber; that in Tochigi, the principal hemp-producing province, is shorter, 5 to 7 feet high, with the best and finest fiber, and in Hokushu it is still shorter.

Seeds from Hiroshima, Shimane, Aidzu, Tochigi, and Iwate were tried by the United States Department of Agriculture in 1901 and 1902. The plants showed no marked varietal differences. They were all smaller than the best Kentucky hemp. The seeds varied from light grayish brown, 5 millimeters ($\frac{1}{5}$ inch) long, to dark gray, 4 millimeters ($\frac{1}{6}$ inch) long. The largest plants in every trial plat were from Hiroshima seeds, and these seeds were larger and lighter colored than those of any other variety except Shimane, the seeds of which were slightly larger and the plants slightly smaller.

[1] Bretschneider, E. Botanicum Sinicum, p. 203, 1893.

RUSSIA.

Hemp is cultivated throughout the greater part of Russia, and it is one of the principal crops in the provinces of Orel, Kursk, Samara, Smolensk, Tula, Voronezh, and Poland. Two distinct types, similar to the tall fiber hemp and the short oil-seed hemp of Manchuria, are cultivated, and there are doubtless many local varieties in isolated districts where there is little interchange of seed. The crop is rather crudely cultivated, with no attempt at seed selection or improvement, and the plants are generally shorter and coarser than the hemp grown in Kentucky. The short oil-seed hemp with slender stems, about 30 inches high, bearing compact clusters of seeds and maturing in 60 to 90 days, is of little value for fiber production, but the experimental plats, grown from seed imported from Russia, indicate that it may be valuable as an oil-seed crop to be harvested and thrashed in the same manner as oil-seed flax.

HUNGARY.

The hemp in Hungary has received more attention in recent years than that in Russia, and this has resulted in a better type of plants. An experimental plat grown at Washington from Hungarian seed attained a height of 6 to 10 feet in the seed row. The internodes were rather short, the branches numerous, curved upward, and bearing crowded seed clusters and small leaves. About one-third of the plants had dark-purple or copper-colored foliage and were more compact in habit than those with normal green foliage.

ITALY.

The highest-priced hemp fiber in the markets of either America or Europe is produced in Italy,[1] but it is obtained from plants similar to those in Kentucky. The higher price of the fiber is due not to superior plants, but to water retting and to increased care and labor in the preparation of the fiber.

Four varieties are cultivated in Italy:

(1) "Bologna," or great hemp, called in France "chanvre de Piedmont," is grown in northern Italy in the provinces of Bologna, Ferrara, Roviga,

[1] Bruck, Werner F. Studien über den Hanfbau in Italien, p. 7, 1911.

and Modena. In the rich alluvial soils and under the intensive cultivation there practiced this variety averages nearly 12 feet in height, but it is said to deteriorate rapidly when cultivated elsewhere.

(2) "Cannapa picola," small hemp, attaining a height of 4 to 7 feet, with a rather slender reddish stalk, is cultivated in the valley of the Arno in the department of Tuscany.[1]

(3) "Neapolitan," large seeded.

(4) "Neapolitan," small seeded.

The two varieties of Neapolitan hemp are cultivated in the vicinity of Naples, and even so far up on the sides of Vesuvius that fields of hemp are occasionally destroyed by the eruptions of that volcano.

Seed of each of these Italian varieties has been grown in trial plats at Washington, D. C., and Lexington, Ky. The Bologna, or Piedmont, hemp in seed rows attained a height of 8 to 11 feet, nearly as tall as Kentucky seed hemp grown for comparison, but with thicker stalks, shorter and more rigid branches, and smaller and more densely clustered leaves. The small hemp, cannapa picola, was only 4 to 6 feet high. The large-seeded Neapolitan was 7 to 10 feet high, smaller than the Bologna, but otherwise more like Kentucky hemp, with more slender stalks and more open foliage. The small-seeded Neapolitan, with seeds weighing less than 1 gram per 100, rarely exceeded 4 feet in height in the series of plats where all were tried.

FRANCE.

Hemp is cultivated in France chiefly in the departments of Sarthe and Ille-et-Vilaine, in the valley of the Loire River. Two varieties are grown, the Piedmont, from Italian seed, and the common hemp of Europe. The former grows large and coarse, though not as tall as in the Bologna region, and it produces a rather coarse fiber suitable for coarse twines. The latter, seed of which is sown at the rate of 1½ to 2 bushels per acre, has a very slender stalk, rarely more than 4 or 5 feet high, producing a fine flaxlike fiber that is largely used in woven hemp linens.

The common hemp of Europe, which includes the short hemp of France, is also cultivated to a limited extent in Spain, Belgium, and Germany. It grows taller and coarser when sown less thickly on rich land, but it never attains the size of the Bologna type.

[1] Dodge, Charles Richards. Culture of hemp in Europe. U. S. Department of Agriculture, Fiber Investigations, Report No. 11, p. 6, 1898.

CHILE.

Chilean hemp, originally from seed of the common hemp of Europe, has developed in three and a half centuries into coarser plants with larger seeds. When sown broadcast for fiber in Chile the plants attain a height of 6 to 8 feet, and when in checks or drills for seed they reach 10 to 12 feet.

Hemp from Chilean seed (S. P. I. No. 24307), grown at the experiment stations at Lexington, Ky., and St. Paul, Minn., in 1909, was 4 to 9 feet high in the broadcast plats and about the same height in the seed drills. It matured earlier than hemp of Chinese origin. Its leaves were small and crowded, with the seed clusters near the ends of slender, spreading branches. The fiber was coarse and harsh. The seeds were very large, 5 to 6 millimeters long, and weighed about 2 grams per 100.

TURKEY.

A variety of hemp, intermediate between the fiber-producing and the typical drug-producing types, is cultivated in Asiatic Turkey, especially in the region of Damascus, and to a limited extent in European Turkey. This variety, called Smyrna, is about the poorest variety from which fiber is obtained. It is cultivated chiefly for the narcotic drug, but fiber is also obtained from the stalks. It grows 3 to 6 feet high, with short internodes, numerous ascending branches, densely crowded foliage of small leaves, and abundant seeds maturing early. It seems well suited for the production of birdseed, but its poor type, combined with prolific seed production, makes it a dangerous plant to grow in connection with fiber crops.

INDIA.

Hemp is cultivated in India over an area of 2,000 to 5,000 acres annually for the production of the narcotic drugs known as hashish, charras, bhang, and ganja. Some fiber is obtained, especially from the staminate plants, in the northern part of Kashmir, where the hemp grown for the production of charras is more like the fiber types than that grown for bhang farther south.

Plants grown by the Department of Agriculture at Washington from seed received from the Botanical Garden at Sibpur, Calcutta, India, agreed almost perfectly with the de-

scription of *Cannabis indica* [1] written by Lamarck more than a century ago. (Pl. XLII, fig. 2.) They were distinctly different in general appearance from any of the numerous forms grown by this department from seed obtained in nearly all countries where hemp is cultivated, but the differences in botanical characters were less marked. The Indian hemp differed from Kentucky hemp in its more densely branching habit, its very dense foliage, the leaves mostly alternate, 7 to 11 (usually 9) very narrow leaflets, and in its nearly solid stalk. It was imperfectly dicœcious, a character not observed in any other variety. Its foliage remained green until after the last leaves of even the pistillate plants of Kentucky hemp had withered and fallen. It was very attractive as an ornamental plant but of no value for fiber.

ARABIA AND AFRICA.

Hemp somewhat similar to that of India, but generally shorter, is cultivated in Arabia, northern Africa, and also by some of the natives in central and southern Africa for the production of the drug, but not for fiber. In Arabia it is called "takrousi," in Morocco "kief" or "kif," and in South Africa "dakkan." None of these plants is suitable for fiber production.

KENTUCKY.

Practically all of the hemp grown in the United States is from seed produced in Kentucky. The first hemp grown in Kentucky was of European origin, the seed having been brought to the colonies, especially Virginia, and taken from there to Kentucky. In recent years there has been practically no importation of seed from Europe. Remnants of the European types are occasionally found in the shorter, more densely branching stalks terminating in thick clusters of small leaves. These plants yield more seed and mature earlier than the more desirable fiber types introduced from China.

Nearly all of the hemp now grown in Kentucky is of Chinese origin. Small packets of seed are received from American missionaries in China. These seeds are carefully cultivated for two or three generations in order to secure a sufficient quantity for field cultivation, and also to acclimate the plants to Kentucky conditions. Attempts to produce

[1] Lamarck. Encyclopedie, v. 1, p. 695, 1788.

fiber plants by sowing imported seed broadcast have not given satisfactory results. Seed of the second or third generation from China is generally regarded as most desirable. This Kentucky hemp of Chinese origin has long internodes, long, slender branches, opposite and nearly horizontal except the upper ones, large leaves usually drooping and not crowded, with the seeds in small clusters near the ends of the branches. Small, dark-colored seeds distinctly mottled are preferred by the Kentucky hemp growers. Under favorable conditions Kentucky hemp attains a height of 7 to 10 feet when grown broadcast for fiber and 9 to 14 feet when cultivated for seed.

IMPROVEMENT BY SEED INTRODUCTION.

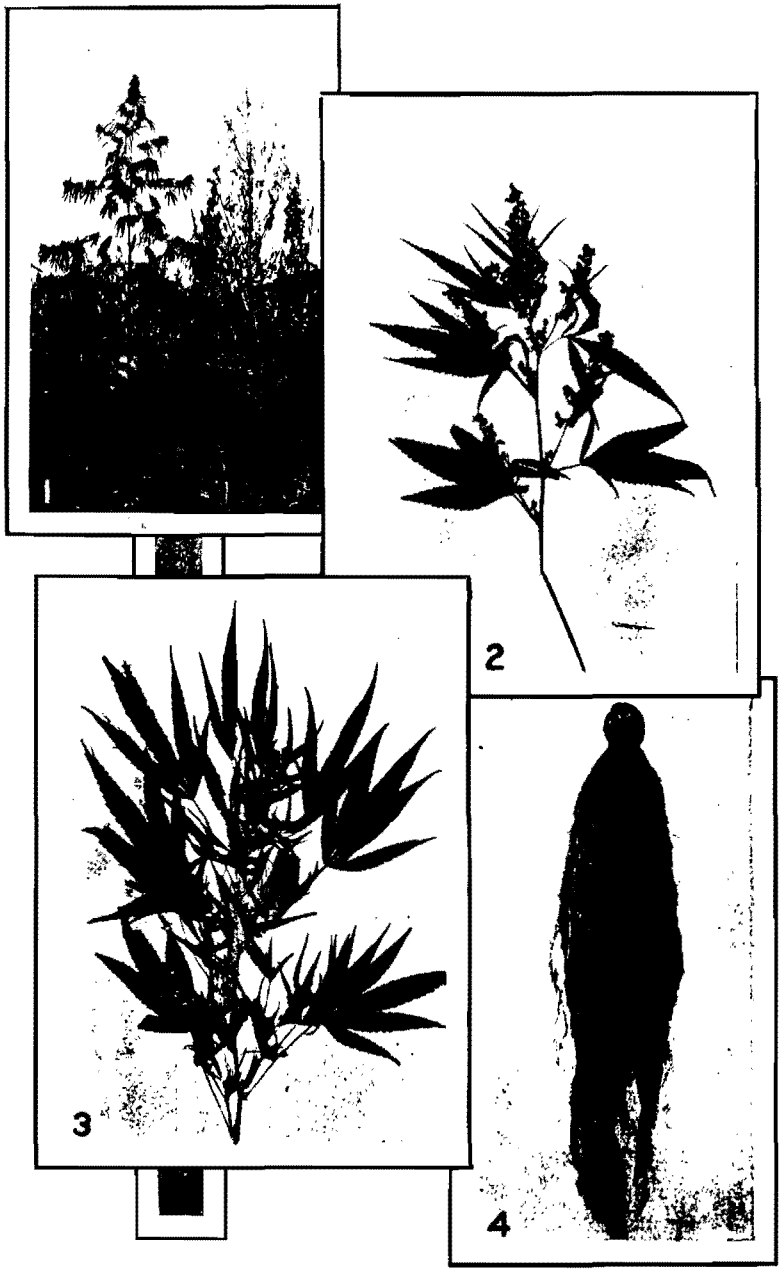
Without selection or continued efforts to maintain superior types, the hemp in Kentucky deteriorates. As stated by the growers, the hemp "runs out." The poorer types of plants for fiber are usually the most prolific seed bearers, and they are often earlier in maturing; therefore, without selection or roguing, the seed of these undesirable types increases more rapidly than that of the tall, late-maturing, better types which bear fewer seeds. New supplies of seed are brought from China to renew the stock. Owing to the confusion of names the seed received is not always of a desirable kind, and sometimes jute, China jute, or ramie seeds are obtained. When seed of the ta-ma variety is secured and is properly cultivated for two or three generations there is a marked improvement, but these improved strains run out in less than 10 years.

The numerous trials that have been made by the Department of Agriculture with hemp seed from nearly all of the sources mentioned and repeated introductions from the more promising sources indicate that little permanent improvement may be expected from mere introduction not followed by breeding and continued selection. In no instance, so far as observed, have any of the plants from imported seed grown as well the first year as the Kentucky hemp cultivated for comparison. Further introduction of seed in small quantities is needed to furnish stock for breeding and selection. The most promising varieties for introduction are ta-ma and shan-ma-tze, from China; Hiroshima and Tochigi, from Japan; Bologna, from Italy; and improved types from Hungary.

IMPROVEMENT BY SELECTION.

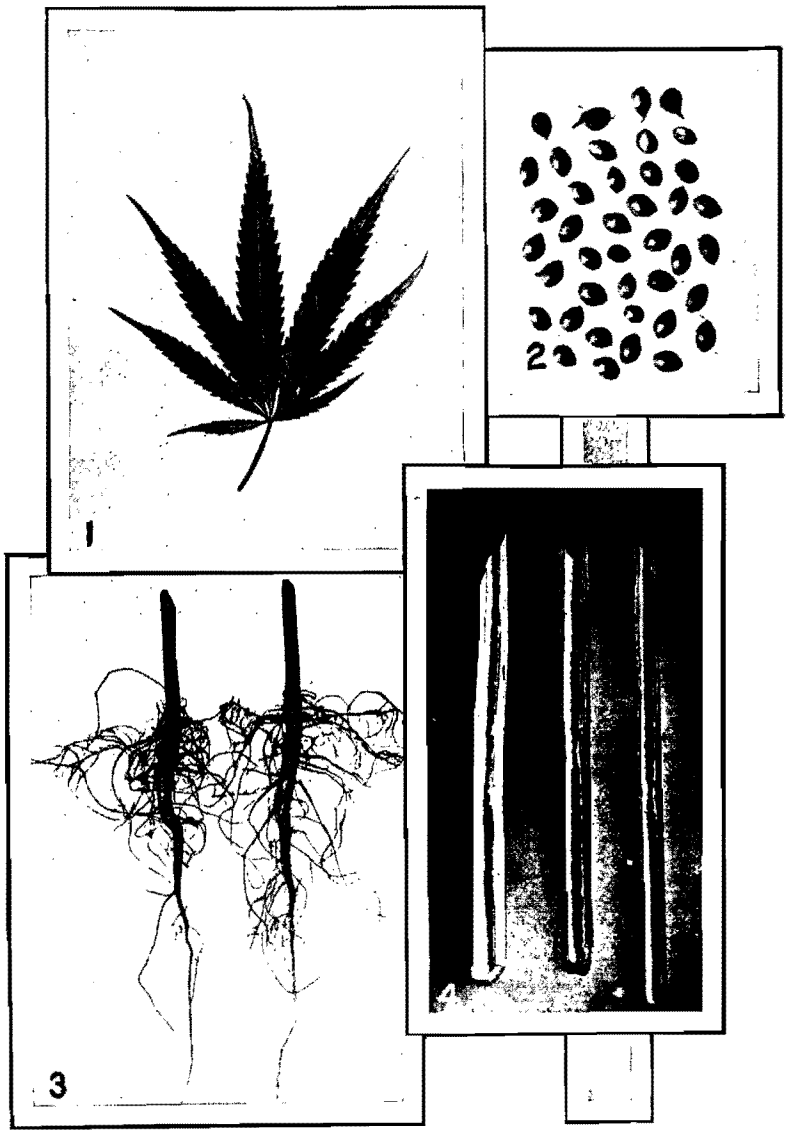
Kentucky hemp is reasonably uniform, not because of selection, or even grading the seeds, but because all types have become mixed together. Nearly all the seed is raised in a limited area. Hemp being cross-fertilized, it is more difficult to keep distinct types separate than in the case of wheat, flax, or other crops with self-pollinated flowers, but it is merely necessary to isolate the plants cultivated for seed and then exercise care to prevent the seed from becoming mixed. Until 1903 no well-planned and continued effort seems to have been undertaken in this country to produce an improved variety of hemp. At that time the results of breeding by careful selection improved varieties of wheat and flax at the Minnesota Agricultural Experiment Station were beginning to yield practical returns to the farmers of that State. Mr. Fritz Knorr, from Kentucky, then a student in the Minnesota College of Agriculture, was encouraged to take up the work with hemp. Seed purchased from a dealer in Nicholasville, Ky., was furnished by the United States Department of Agriculture. The work of selection was continued until 1909 under the direction of Prof. C. P. Bull, agronomist at the station. Points especially noted in selecting plants from which to save seed for propagation were length of internode, thinness of shell, height, and tendency of the stems to be well fluted. The seasons there were too short to permit selection for plants taking a longer season for growth. The improved strain of hemp thus developed was called Minnesota No. 8. Seed of this strain sown at the experiment station at Lexington, Ky., in 1910 and 1911 produced plants more uniform than those from unselected Kentucky seed, and the fiber was superior in both yield and quality. A small supply of this seed, grown by the Department of Agriculture at Washington, D. C., in 1912, was distributed to Kentucky hemp-seed growers in 1913, and in every instance the resulting seed plants were decidedly superior to those from ordinary Kentucky seed.

Seed selection is practiced to a limited extent on some of the best hemp-seed farms in Kentucky. Before the seed-hemp plants are cut the grower goes through the field and marks the plants from which seed is to be saved for the seed crop of the following year. Plants are usually selected for height, lateness, and length of internodes. Continued selec-



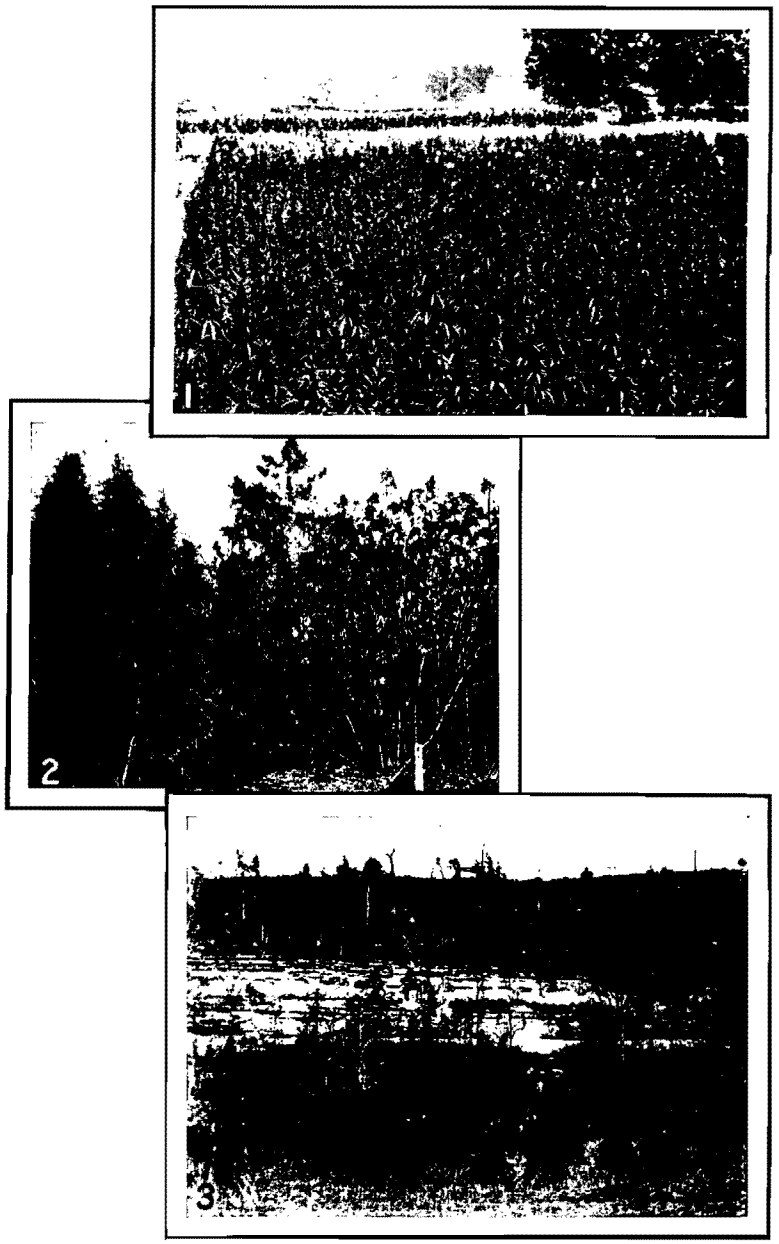
HEMP, PLANT AND FIBER.

Fig. 1.—Pistillate plant, left; staminate plant, right. Fig. 2.—Staminate flowers. Fig. 3.—Pistillate flowers. Fig. 4.—Fiber in the form in which it leaves the farm.



DETAILS OF HEMP PLANT.

Fig. 1.—Leaf, one-third natural size. Fig. 2.—Seeds, natural size. Fig. 3.—Roots, showing strong taproot. Fig. 4.—Sections of stalk, showing woody shell slightly thickened at the nodes.



DIFFERENT TYPES OF HEMP AND SEED HEMP.

Fig. 1.—Manchurian oil-seed hemp. Fig. 2.—India drug-producing hemp on left: Kentucky fiber-producing hemp in seed rows on right. Fig. 3.—Hemp-seed field in Kentucky River Valley, walled in with ledges of lime rock.

SEED HEMP AND MALADIES.

Fig. 1.—Shock of seed hemp curing. Fig. 2.—Seed-hemp plant attacked by fungus disease. Fig. 3.—Branched broom rape, parasitic on hemp roots.

tion in this manner will improve the type. Without selection continued each season, the general average of the crop deteriorates.

CLIMATE.

Hemp requires a humid temperate climate, such as that throughout the greater part of the Mississippi Valley. It has been grown experimentally as far north as Saskatoon, in northwestern Canada, and as far south as New Orleans, La., and Brunswick, Ga.

TEMPERATURE.

The best fiber-producing types of hemp require about four months free from killing frosts for the production of fiber and about five and one-half months for the full maturity of the seeds. The climatic conditions during the four months of the hemp-growing season in the region about Lexington, Ky., are indicated by the following table:

Temperature and rainfall in the hemp-growing region of Kentucky.[1]

Month.	Temperature.			Precipitation.		
	Mean.	Absolute maximum.	Absolute minimum.	Mean.	Total amount driest year.	Total amount wettest year.
	°F.	°F.	°F.	Inches.	Inches.	Inches.
May	64	91	32	3.6	2.7	4.7
June	73	95	42	4.2	3.7	7.4
July	76	102	51	4.0	2.6	3.1
August	75	96	51	3.8	3.7	7.3
Mean for 4 months	72			3.9		
Annual mean	55			42.5		

[1] Henry, Alfred Judson. Climatology of the United States. U. S. Department of Agriculture, Weather Bureau, Bulletin Q, p. 762, 1906.

Hemp grows best where the temperature ranges between 60° and 80° F., but it will endure colder and warmer temperatures. Young seedlings and also mature plants will endure with little injury light frosts of short duration. Young hemp is less susceptible than oats to injury from frost, and fields of hemp ready for harvest have been uninjured by frosts which ruined fields of corn all around them. Frosts are injurious to nearly mature plants cultivated for seed production.

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RAINFALL.

Hemp requires a plentiful supply of moisture throughout its growing season, and especially during the first six weeks. After it has become well rooted and the stalks are 20 to 30 inches high it will endure drier conditions, but a severe drought hastens its maturity and tends to dwarf its growth. It will endure heavy rains, or even a flood of short duration, on light, well-drained soils, but on heavy, impervious soils excessive rain, especially when the plants are young, will ruin the crop.

In 1903, a large field of hemp on rich, sandy-loam soil of alluvial deposit, well supplied with humus, near Gridley, Cal., was flooded to a depth of 2 to 6 inches by high water in the Feather River. The hemp had germinated but a few days before and was only 1 to 3 inches high. The water remained on the land about three days. The hemp started slowly after the water receded, but in spite of the fact that there was no rain from this time, the last of March, until harvest, the last of August, it made a very satisfactory crop, 6 to 12 feet in height. The soil, of porous, spongy texture, remained moist below the dusty surface during the entire growing season.

An experimental crop of about 15 acres on impervious clay and silt of alluvial deposit, but lacking in humus, in eastern Louisiana was completely ruined by a heavy rain while the plants were small.

The total average rainfall during the four months of the hemp-growing season in Kentucky is 15.6 inches, as shown in the table on page 305, and this is distributed throughout the season. When there is an unusual drought in that region, as in 1913, the hemp is severely injured. It is not likely to succeed on upland soils in localities where corn leaves curl because of drought before the middle of August.

IRRIGATION.

In 1912, and again in 1913, crops of hemp were cultivated under irrigation at Lerdo, Cal. The soil there is an alluvial sandy loam of rather firm texture, but with good natural drainage and not enough clay to form a crust on the surface after flooding with water. The land is plowed deeply, leveled, and made up into irrigation blocks with low borders over which drills and harvesting machinery may easily work.

The seed is drilled in the direction of the fall, so that when flooded the water runs slowly down the drill furrows. Three irrigations are sufficient, provided the seed is sown early enough to get the benefit of the March rains. The fiber thus produced is strong and of good quality.

WEATHER FOR RETTING AND BREAKING.

Cool, moist weather, light snows, or alternate freezing and thawing are favorable for retting hemp. Dry weather, not necessarily free from rain but with a rather low relative humidity, is essential for satisfactory work in breaking hemp. The relative humidity at Lexington in January, February, and March, when most of the hemp is broken, ranges from 62 to 82 per cent. The work of breaking hemp is rarely carried on when there is snow on the ground. The work of collecting and cleaning hemp seed can be done only in dry weather.

SOIL.

SOILS IN THE HEMP-GROWING REGION OF KENTUCKY.

The soil in most of the hemp fields of Kentucky is of a yellowish clay loam, often very dark as a result of decaying vegetable matter, and most of it overlying either Lexington or Cincinnati limestone. There are frequent outcroppings of lime rock throughout the region. The soil is deep, fertile, well supplied with humus, and its mechanical condition is such that it does not quickly dry out or become baked and hard. The land is rolling, affording good natural drainage.

HEMP SOILS IN OTHER STATES.

In eastern Nebraska, hemp has been grown on a deep clay-loam prairie soil underlain with lime rock. In some of the fields there are small areas of gumbo soil, but hemp does not grow well on these areas. In California, hemp is cultivated on the reclaimed lands of alluvial deposits in the lower valley of the Sacramento River. This is a deep soil made up of silt and sand and with a very large proportion of decaying vegetable matter. These rich, alluvial soils, which are never subject to drought, produce a heavier growth of hemp than the more shallow upland soils in Kentucky. In Indiana, crops of hemp have been grown in the Kankakee Valley on peaty soils overlying marl or yellow clay containing an abundance of lime. These lands have

been drained by large, open ditches. There is such a large proportion of peat in the soil that it will burn for months if set on fire during the dry season, yet this soil contains so much lime that when the vegetation is cleared away Kentucky bluegrass comes in rather than sedges. It is an alkaline rather than an acid soil. The large amount of peat gives these soils a loose, spongy texture, well adapted to hold moisture during dry seasons. Water remains in the ditches 6 to 10 feet below the surface nearly all summer, and the hemp crops have not been affected by the severe drought which has injured other crops on the surrounding uplands. In southeastern Pennsylvania, and in Indiana, Wisconsin, and Minnesota, the best crops, producing the largest yields of fiber and fiber of the best quality, have been grown on clay-loam upland soils. In some instances, however, the upland crops have suffered from drought.

SOILS SUITED TO HEMP.

Hemp requires for the best development of the plant, and also for the production of a large quantity and good quality of fiber, a rich, moist soil having good natural drainage, yet not subject to severe drought at any time during the growing season. A clay loam of rather loose texture and containing a plentiful supply of decaying vegetable matter or an alluvial deposit alkaline and not acid in reaction should be chosen for this crop.

SOILS TO BE AVOIDED.

Hemp will not grow well on stiff, impervious, clay soils, or on light sandy or gravelly soils. It will not grow well on soils that in their wild state are overgrown with either sedges or huckleberry bushes. These plants usually indicate acid soils. It will make only a poor growth on soils with a hardpan near the surface or in fields worn out by long cultivation. Clay loams or heavier soils give heavier yields of strong but coarser fiber than are obtained on sandy loams and lighter soils.

EFFECT OF HEMP ON THE LAND.

Hemp cultivated for the production of fiber, cut before the seeds are formed and retted on the land where it has been grown, tends to improve rather than injure the soil. It improves its physical condition, destroys weeds, and does not exhaust its fertility.

PHYSICAL CONDITION.

Hemp loosens the soil and makes it more mellow. The soil is shaded by hemp more than by any other crop. The foliage at the top of the growing plants makes a dense shade and, in addition, all of the leaves below the top fall off, forming a mulch on the ground, so that the surface of the soil remains moist and in better condition for the action of soil bacteria. The rather coarse taproots (Pl. XLI, fig. 3), penetrating deeply and bringing up plant food from the subsoil, decay quickly after the crop is harvested and tend to loosen the soil more than do the fibrous roots of wheat, oats, and similar broadcast crops. Land is more easily plowed after hemp than after corn or small grain.

HEMP DESTROYS WEEDS.

Very few of the common weeds troublesome on the farm can survive the dense shade of a good crop of hemp. If the hemp makes a short, weak growth, owing to unsuitable soil, drought, or other causes, it will have little effect in checking the growth of weeds, but a good, dense crop, 6 feet or more in height, will leave the ground practically free from weeds at harvest time. In Wisconsin, Canada thistle has been completely killed and quack-grass severely checked by one crop of hemp. In one 4-acre field in Vernon County, Wis., where Canada thistles were very thick, fully 95 per cent of the thistles were killed where the hemp attained a height of 5 feet or more, but on a dry, gravelly hillside in this same field where it grew only 2 to 3 feet high, the thistles were checked no more than they would have been in a grain crop. Some vines, like the wild morning-glory and bindweed climb up the hemp stalks and secure light enough for growth, but low-growing weeds can not live in a hemp field.

HEMP DOES NOT EXHAUST THE FERTILITY OF THE SOIL.

An abundant supply of plant food is required by hemp, but most of it is merely borrowed during development and returned to the soil at the close of the season. The amounts of the principal fertilizing elements contained in mature crops of hemp, as compared with other crops, are shown in the accompanying table.

Amounts of principal fertilizing elements in an acre of hemp, corn, wheat, oats, sugar beets, and cotton.

Crops.	Nitrogen.	Phosphoric acid.	Potassium.
	Pounds.	*Pounds.*	*Pounds.*
Hemp (yielding 1,000 pounds of clean fiber) [1]	62.7	33.2	101.3
Corn (50 bushels and 1½ tons of stover) [2]	74.0	11.5	35.5
Wheat (25 bushels of grain, 1½ tons of straw) [2]	48.0	8.0	24.0
Oats (50 bushels of grain, 1½ tons of straw) [2]	48.5	8.0	34.0
Sugar beets (20 tons of roots) [2]	100.0	18.0	157.0
Cotton (yielding 400 pounds of lint) [1]	29.2	22.5	35.3

[1] Jaffa, M. E. Composition of the Ramie Plant. California Experiment Station Bulletin, p. 94, 1891.

[2] Hopkins, Cyril G., and Pettit, James H. The Fertility in Illinois Soils. Illinois Experiment Station Bulletin 123, p. 189, 1908.

The data in the table indicate that hemp requires for its best development a richer soil than any of the other crops mentioned except sugar beets. These other crops, except the stalks of corn and the tops of beets, are entirely removed from the land, thus taking away nearly all the plant food consumed in their growth. Only the fiber of hemp is taken away from the farm and this is mostly cellulose, composed of water and carbonic acid.

The relative proportions by weight of the different parts of the hemp plant, thoroughly air dried, are approximately as follows: Roots 10 per cent, stems 60 per cent, and leaves 30 per cent.[1] The mineral ingredients of these different parts of the hemp plant are shown in the following table:

Ash ingredients of the leaves, stalks, and roots of the hemp plant, carbonic acid excluded, 100 parts dried material in each case.[1]

Ingredients.	Leaves.	Stalks.	Roots.
Lime	4.992	0.949	0.713
Magnesia	.585	.194	.291
Potash	2.858	1.659	1.829
Soda	.024		
Phosphoric acid	.947	.447	.531
Sulphuric acid	.226	.040	.047
Chlorin	.017	.019	.014
Silica	.575	.035	.077
Percentage of ash	10.224	3.343	3.502

[1] Peter, Robert. Chemical Examination of the Ash of Hemp and Buckwheat Plants. Kentucky Geological Survey, p. 12, 1884.

The foliage, constituting nearly one-third of the weight of the entire plant and much richer in essential fertilizing elements than the stalks, all returns to the field where the hemp grows. The roots also remain and, together with the stubble, they constitute more than 10 per cent of the total weight and contain approximately the same proportions of fertilizing elements as the stalks. The leaves and roots therefore return to the soil nearly two-thirds of the fertilizing elements used in building up the plant.

After the hemp is harvested it is spread out on the same land for retting. In this retting process nearly all of the soluble ingredients are washed out and returned to the soil. When broken in the field on small hand brakes, as is still the common practice in Kentucky, the hurds, or central woody portion of the stalk, together with most of the outer bark, are left in small piles and burned, returning the mineral ingredients to the soil. Where machine brakes are used the hurds may serve an excellent purpose as an absorbent in stock yards and pig pens, to be returned to the fields in barnyard manure.

The mineral ingredients permanently removed from the farm are thus reduced to the small proportions contained in the fiber. These proportions, calculated in pounds per acre and compared with the amounts removed by other crops, are shown in the following table:

Mineral ingredients removed from the soil by hemp, wheat, corn, and tobacco, calculated in pounds per acre.[1]

Ingredients.	Hemp fiber: In 800 pounds.	Wheat: In 20 bushels.	Corn: In 50 bushels.	Tobacco, including stalks: In 1,000 pounds.
Lime	7.872	1.63	0.22	68.00
Magnesia	1.128	2.43	3.61	8.67
Potash	.968	5.45	8.06	69.73
Soda	.096	.13	6.22	6.80
Phosphoric acid	2.080	9.12	11.85	8.13
Sulphuric acid	.232	.08	(2)	8.40
Chlorin	.016	.35	(2)	1.06
Silica	.736	.41	.71	5.86
Total ash	13.128	19.60	30.67	176.05

[1] Peter, Robert. Chemical Examination of the Ash of Hemp and Buckwheat Plants. Kentucky Geological Survey, p. 17, 1884.

[2] Not estimated.

The hemp fiber analyzed was in the ordinary condition as it leaves the farm. When washed with cold water, removing some but not all of the dirt, the ashy residue was reduced more than one-third, and the total earthy phosphates were reduced nearly one-half. The amount of plant food actually removed from the soil by hemp is so small as to demand little attention in considering soil exhaustion. The depletion of the humus is the most important factor, but even in this respect hemp is easier on the land than other crops except clover and alfalfa. The fact that hemp is often grown year after year on the same land for 10 to 20 years, with little or no application of fertilizer and very little diminution in yield, is evidence that it does not exhaust the soil.

ROTATION OF CROPS.

In Kentucky, hemp is commonly grown year after year on the same land without rotation. It is the common practice in that State to sow hemp after bluegrass on land that has been in pasture for many years, or sometimes it is sown as the first crop on recently cleared timberland. It is then sown year after year until it ceases to be profitable or until conditions favor the introduction of other crops. On the prairie soils in eastern Nebraska and also on the peaty soils in northern Indiana, more uniform crops were obtained after the first year. On some of the farms in California hemp is grown in rotation with beans. Hemp is recommended to be grown in rotation with other farm crops on ordinary upland soils suited to its growth. In ordinary crop rotations it would take about the same place as oats. If retted on the same land, however, it would occupy the field during the entire growing season, so that it would be impossible to sow a field crop after hemp unless it were a crop of rye. The growing of rye after hemp has been recommended in order to prevent washing and to retain the soluble fertilizing elements that might otherwise be leached out during the winter. This recommendation, however, has not been put in practice sufficiently to demonstrate that it is of any real value. Hemp will grow well in a fertile soil after any crop, and it leaves the land in good condition for any succeeding crop. Hemp requires a plentiful supply of fertilizing elements, especially nitrogen, and it is therefore best

to have it succeed clover, peas, or grass sod. If it follows wheat, oats, or corn, these crops should be well fertilized with barnyard manure. The following crop rotations are suggested for hemp on fertile upland soils:

First year.	Second year.	Third year.	Fourth year.	Fifth year.
Hemp	Corn	Wheat	Clover	Grass and pasture.
Do	Sugar beets, potatoes, or onions.	...do	.....do	Do.
Corn	Peas or beans	Hemp	Barley or oats	Clover.

Hemp leaves the ground mellow and free from weeds and is therefore recommended to precede sugar beets, onions, celery, and similar crops which require hand weeding. If hemp is grown primarily to kill Canada thistle, quackgrass, or similar perennial weeds, it may be grown repeatedly on the same land until the weeds are subdued.

FERTILIZERS.

Hemp requires an abundant supply of plant food. Attaining in four months a height of 6 to 12 feet and producing a larger amount of dry vegetable matter than any other crop in temperate climates, it must be grown on a soil naturally fertile or enriched by a liberal application of fertilizer. In Europe and in Asia heavy applications of fertilizers are used to keep the soils up to the standard for growing hemp, but in the United States most of the hemp is grown on lands the fertility of which has not been exhausted by centuries of cultivation. In Kentucky, where the farms are well stocked with horses and cattle, barnyard manure is used to maintain the fertility of the soils, but it is usually applied to other crops and not directly to hemp. In other States no fertilizer has been applied to soils where hemp is grown, except in somewhat limited experiments.

BARNYARD MANURE.—The best single fertilizer for hemp is undoubtedly barnyard manure. It supplies the three important plant foods, nitrogen, potash, and phosphoric acid, and it also adds to the store of humus, which appears to be more necessary for hemp than for most other farm crops. If other fertilizers are used, it is well to apply barnyard manure also, but it should be applied to the preceding crop,

or, at the latest, in the fall before the hemp is sown. It must be well rotted and thoroughly mixed with the soil before the hemp seed is sown, so as to promote a uniform growth of the hemp stalks. Uniformity in the size of the plants of other crops is of little consequence, but in hemp it is a matter of prime importance. An application of coarse manure in the spring, just before sowing, is likely to result in more injury than benefit. The amount that may be applied profitably will vary with different soils. There is little danger, however, of inducing too rank a growth of hemp on upland soils, provided the plants are uniform, for it must be borne in mind that stalk and not fruit is desired. On soils deficient in humus as the result of long cultivation, the increased growth of hemp may well repay for the application of 15 to 20 tons of barnyard manure per acre. It would be unwise to sow hemp on such soils until they had been heavily fertilized with barnyard manure.

COMMERCIAL FERTILIZERS.—On worn-out soils, peaty soils, and possibly on some alluvial soils, commercial fertilizers may be used with profit in addition to barnyard manure. The primary effect to be desired from commercial fertilizers on hemp is a more rapid growth of the crop early in the season. This rapid early growth usually results in a greater yield and better quality of fiber. The results of a series of experiments conducted at the agricultural experiment station at Lexington, Ky., in 1889 led to the following conclusions:[1]

(1) That hemp can be raised successfully on worn bluegrass soils with the aid of commercial fertilizers.

(2) That both potash and nitrogen are required to produce the best results.

(3) That the effect was the same, whether muriate or sulphate was used to furnish potash.

(4) That the effect was about the same, whether nitrate of soda or sulphate of ammonia was used to furnish nitrogen.

(5) That a commercial fertilizer containing about 6 per cent of available phosphoric acid, 12 per cent of actual potash, and 4 per cent of nitrogen (mostly in the form of nitrate of soda or sulphate of ammonia) would be a good fertilizer for trial.

The increased yield and improved quality of the fiber on the fertilized plats compared with the yield from the check plat, not fertilized, in these experiments would warrant the

[1] Scovel, M. A. Effect of Commercial Fertilizers on Hemp. Kentucky Agricultural Experiment Station, Bulletin 27, p. 3, 1890.

application of nitrogen at the rate of 160 pounds of nitrate of soda or 120 pounds of sulphate of ammonia per acre, and potash at the rate of about 160 pounds of either sulphate or muriate of potash per acre.

On the rich alluvial soils reclaimed by dikes from the Sacramento River at Courtland, Cal., Mr. John Heaney has found that an application of nitrate of soda at the rate of not more than 100 pounds per acre soon after sowing and again two weeks to a month later, or after the first application has been washed down by rains, will increase the yield and improve the quality of the fiber.

LEGUMINOUS CROPS OR GREEN MANURE.—Beans grown before hemp and the vines returned to the land and plowed under have given good results in increased yield and improved quality of fiber on alluvial soils at Courtland, Cal. Clover is sometimes plowed under in Kentucky to enrich the land for hemp. It must be plowed under during the preceding fall, so as to become thoroughly rotted before the hemp is grown.

HEMP AS A GREEN MANURE.—In experiments with various crops for green manure for wheat in India, hemp was found to give the best results.[1] In exceptionally dry seasons, as in 1908 and 1913, many fields of hemp do not grow high enough to be utilized profitably for fiber production. They are often left until fully mature and then burned. Better results would doubtless be obtained if the hemp were plowed under as soon as it could be determined that it would not make a sufficient growth for fiber production. Mature hemp stalks or dry hurds should not be plowed under, because they rot very slowly

DISEASES, INSECTS, AND WEEDS.

Hemp is remarkably free from diseases caused by fungi. In one instance at Havelock, Nebr., in a low spot where water had stood, nearly 3 per cent of the hemp plants were dead. The roots of these dead plants were pink in color and a fungous mycelium was found in them, but it was not in a stage of development to permit identification. The fungus was probably not the primary cause of the trouble, since the dead plants were confined to the low place and

[1] Report of Cawnpore Agricultural Station, United Provinces, India, for 1908, p. 12.

there was no recurrence of the disease on hemp grown in the same field the following year.

A fungus described under the name *Dendrophoma marconii* Cav. was observed on hemp in northern Italy in 1887.[1] This fungus attacked the plants after they were mature enough to harvest for fiber. Its progress over the plant attacked and also the distribution of the infection over the field were described as very rapid, but if the disease is discovered at its inception and the crop promptly harvested it causes very little damage.

In the fall of 1913 a disease was observed on seed hemp grown by the Department of Agriculture at Washington. (Pl. XLIII, fig. 2.) It did not appear until after the stage of full flowering of the staminate plants and therefore after the stage for harvesting for fiber. A severe hailstorm had bruised the plants and broken the bark, doubtless making them more susceptible to the disease. The first symptoms noted in each plant attacked were wilted leaves near the ends of branches above the middle of the plant, accompanied by an area of discolored bark on the main stalk below the base of each diseased branch. In warm, moist weather the disease spread rapidly, killing a plant 10 feet high in five days and also infesting other plants. It was observed only on pistillate plants, but the last late-maturing staminate plants left in the plat after thinning the earlier ones were cut soon after the disease was discovered.[2]

In a few instances insects boring in the stems have killed some plants, but the injury caused in this manner is too small to be regarded as really troublesome.

Cutworms have caused some damage in the late-sown hemp in land plowed in the spring, but there is practically no danger from this source in hemp sown at the proper season and in fall-plowed land well harrowed before sowing.

A Chilean dodder (*Cuscuta racemosa*) troublesome on alfalfa in northern California was found on the hemp at Gridley, Cal., in 1903. Although it was abundant in some parts of the field at about the time the hemp was ready for harvest, it did not cause any serious injury.

[1] Cavara, Fridiano. Appunti di Patologia Vegetal. Atti dell' Instituto Botanico dell' Universitá di Pavia, s. 2, v. 1, p. 425, 1888.

[2] This fungus was not in a stage permitting identification, but cultures for further study were made in the Laboratory of Plant Pathology.

Black bindweed (*Polygonum convolvulus*) and wild morning-glory (*Convolvulus sepium*) sometimes cause trouble in low, rich land by climbing up the plants and binding them together.

The only really serious enemy to hemp is branched broom rape (*Orobanche ramosa*). (Pl. XLIII, fig. 3.) This is a weed 6 to 15 inches high, with small, brownish yellow, scalelike leaves and rather dull purple flowers. The entire plant is covered with sticky glands which catch the dust and give it a dirty appearance. Its roots are parasitic on the roots of hemp. It is also parasitic on tobacco and tomato roots.[1] Branched broom rape is troublesome in Europe and the United States, but is not known in Asia. Its seeds are very small, about the size of tobacco seed, and they stick to the gummy calyx surrounding the hemp seed when the seed-hemp plants are permitted to fall on the ground in harvesting. There is still more opportunity for them to come in contact with the seed of hemp grown for fiber. The broom rape is doubtless distributed more by means of lint seed (seed from overripe fiber hemp) than by any other means. When broom rape becomes abundant it often kills a large proportion of the hemp plants before they reach maturity. As a precaution it is well to sow only well-cleaned seed from cultivated hemp and insist on a guaranty of no lint seed. If the land becomes infested, crops other than hemp, tobacco, tomatoes, or potatoes should be grown for a period of at least seven years. The seeds retain their vitality several years.[2]

HEMP-SEED PRODUCTION.

All of the hemp seed used in the United States for the production of hemp for fiber is produced in Kentucky. Nearly all of it is obtained from plants cultivated especially for seed production and not for fiber. The plants cultivated for seed for the fiber crop are of the fiber-producing type and not the type commonly obtained in bird-seed hemp. Old stocks of hemp seed of low vitality are often sold for bird seed, but much of the hemp seed sold by seedsmen or dealers in bird supplies is of the densely branching Smyrna type.

[1] Garman, H. The Broom-Rape of Hemp and Tobacco. Kentucky Agricultural Experiment Station, Bulletin 24, p. 16, 1890.

[2] Garman, H. The Broom-Rapes. Kentucky Agricultural Experiment Station, Bulletin 105, p. 14, 1903.

LINT SEED.

In some instances seed is saved from hemp grown for fiber but permitted to get overripe before cutting. This is known as lint seed. It is generally regarded as inferior to seed from cultivated plants. A good crop is sometimes obtained from lint seed, but it is often lacking in vigor as well as germinative vitality, and it is rare that good crops are obtained from lint seed of the second or third generation.

CULTIVATED SEED.

Nearly all of the cultivated seed is grown in the valley of the Kentucky River and along the creeks tributary to this river for a distance of about 50 miles above High Bridge. The river through this region flows in a deep gorge about 150 feet below the general level of the land. The sides of this valley are steep, with limestone outcropping, and in some places perpendicular ledges of lime rock in level strata. (Pl. XLII, fig. 3.) The river, which overflows every spring, almost covering the valley between the rocky walls, forms alluvial deposits from a few rods to half a mile in width. The seed hemp is grown on these inundated areas, and especially along the creeks, where the water from the river backs up, leaving a richer deposit of silt than along the banks of the river proper, where the deposited soils are more sandy. There is a longer season free from frost in these deep valleys than on the adjacent highlands. Instead of having earlier frosts in the fall, as may be usually expected in lowlands, the valley is filled with fog on still nights, thus preventing damage from frost. For the production of hemp seed a rich, alluvial soil containing a plentiful supply of lime and also a plentiful supply of moisture throughout the growing season is necessary. The crop also requires a long season for development. The young seedlings will endure light frosts without injury, but a frost before harvest will nearly ruin the crop. A period of dry weather is necessary after the harvest in order to beat out and clean the seeds.

PREPARATION OF LAND.

The land is plowed as soon as possible after the spring floods, which usually occur in February and early in March.

After harrowing, it is marked in checks about 4 or 5 feet each way. Hemp cultivated for seed production must have room to develop branches. (Pl. XL, fig. 1.)

PLANTING.

The seed is planted between the 20th of March and the last of April—usually earlier than the seed is sown for the production of fiber. It is usually planted by hand, 5 to 7 seeds in a hill, and covered with a hoe. In some instances planters are used, somewhat like those used for planting corn, and on some farms seeders are used which plant 1 or 2 drills at a time 4 or 5 feet apart. When planted in drills it is usually necessary to thin out the plants afterwards. One or two quarts of seed are sufficient to plant an acre. Less than one quart would be sufficient if all the plants were allowed to grow.

CULTIVATION.

On the best farms the crop is cultivated four times—twice rather deep and twice with cultivators with fine teeth, merely stirring the surface. When the first flowers are produced, so that the staminate plants may be recognized, all of these plants are cut out except about one per square rod. These will produce sufficient pollen to fertilize the flowers on the pistillate, or seed-bearing plants, and the removal of the others will give more room for the development of the seed-bearing plants.

HARVEST.

The seed-bearing plants are allowed to remain until fully mature, or as long as possible without injury from frost. They are cut with corn knives, usually during the first half of October, leaving the stubble 10 to 20 inches high. The plants are set up in loose shocks around one or two plants which have been left standing. The shocks are usually bound near the top with binder twine. They are left in this manner for two or three weeks, until thoroughly dry. (Pl. XLIII, fig. 1.)

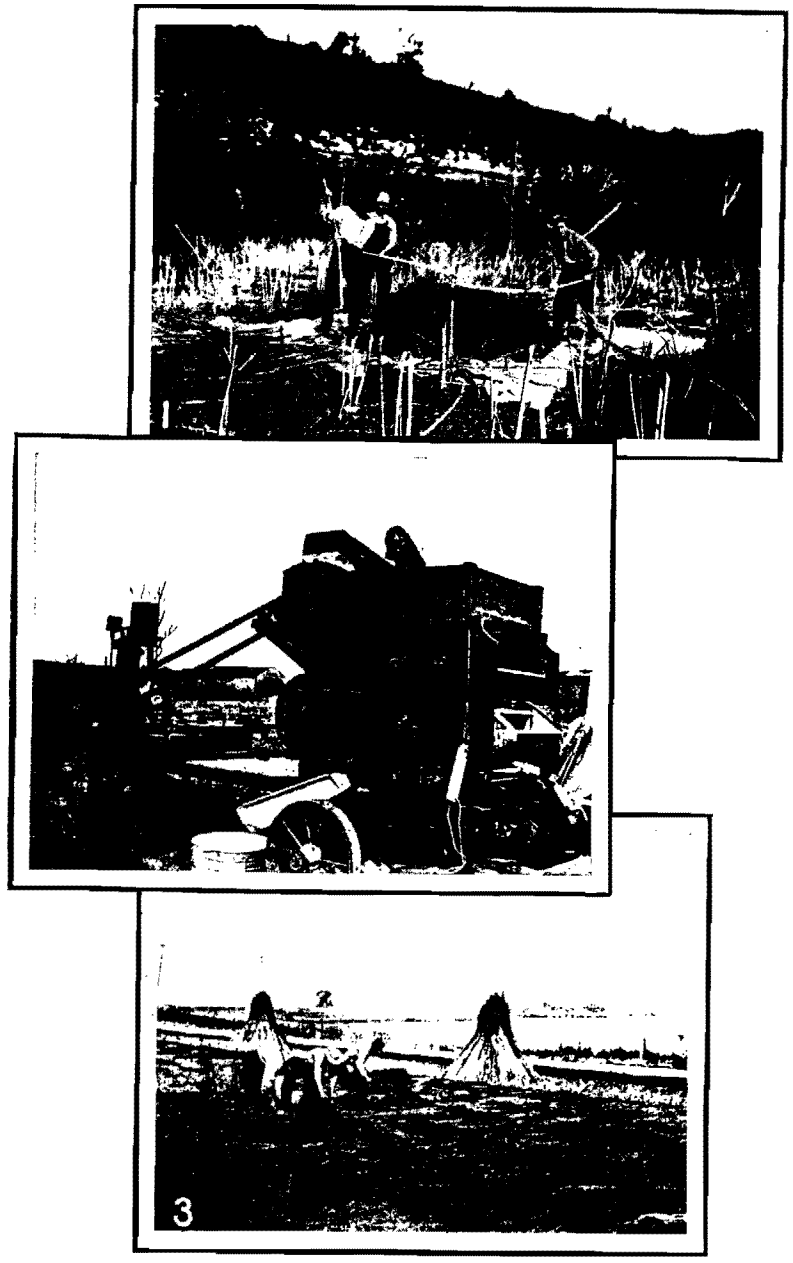
COLLECTING THE SEED.

When the seed hemp is thoroughly dry, men (usually in gangs of five or six, with tarpaulins about 20 feet square) go

into the field. One man with an ax cuts off the hemp stubble between four shocks and clears a space large enough to spread the tarpaulin. The other men pick up an entire shock and throw it on the tarpaulin. They then beat off the seeds with sticks about 5 feet long and 1½ inches in diameter. (Pl. XLIV, fig. 1.) When the seed has been beaten off from one side of the shock the men turn it over by means of the sticks, and after beating off all of the seed they pick up with the sticks the stalks in one bunch and throw them off the canvas, and then treat another shock in the same manner. They will beat off the seed from four shocks in 15 to 20 minutes, securing 2 or 3 pecks of seed from each shock. While this seems a rather crude way of collecting the seed, it is doubtless the most economical and practical method that may be devised. The seed falls so readily from the dry hemp stalks that it would be impossible to move them without a very great loss. Furthermore, it would be very difficult to handle plants 10 to 14 feet high, with rigid branches 3 to 6 feet in length, so as to feed them to any kind of thrashing machine.

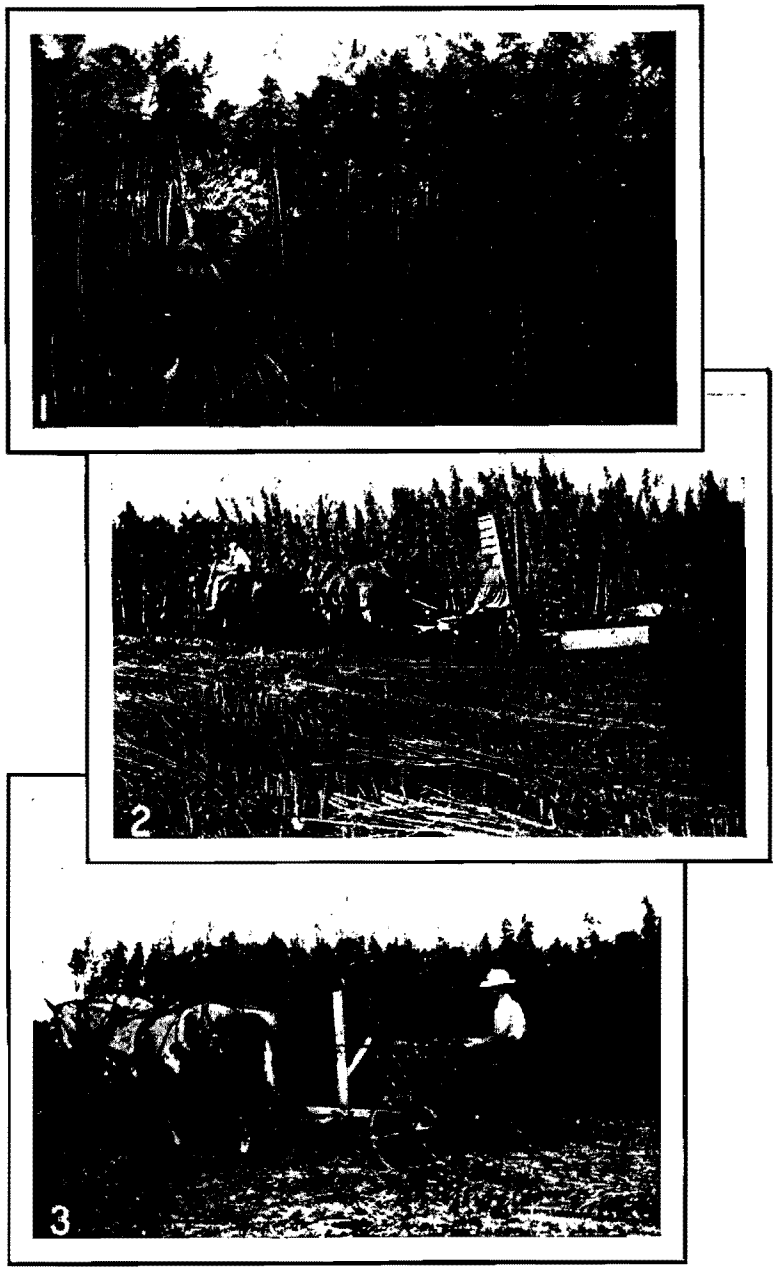
CLEANING THE SEED.

The seed and chaff which have been beaten on the tarpaulin are sometimes beaten or tramped to break up the coarser bunches and stalks, and in some instances they are rubbed through coarse sieves in order to reduce them enough to be put through a fanning mill. The seed is then partly cleaned by a fanning mill in the field and afterwards run once or twice through another mill with finer sieves and better adjustments of fans. Even after this treatment it is usually put through a seed-cleaning machine by the dealers. There has recently been introduced on some of the best seed-hemp farms a kind of homemade thrashing machine, consisting essentially of a feeding device, cylinder, and concaves, attached to a rather large fanning mill, all being driven by a gasoline engine. (Pl. XLIV, fig. 2.) The hemp seed is fed to this machine just as it comes from the tarpaulin after beating off from the shock. It combines the process of breaking up the chaff into finer pieces and the work of fanning the seed in the field, and it performs this work more effectively and more rapidly.



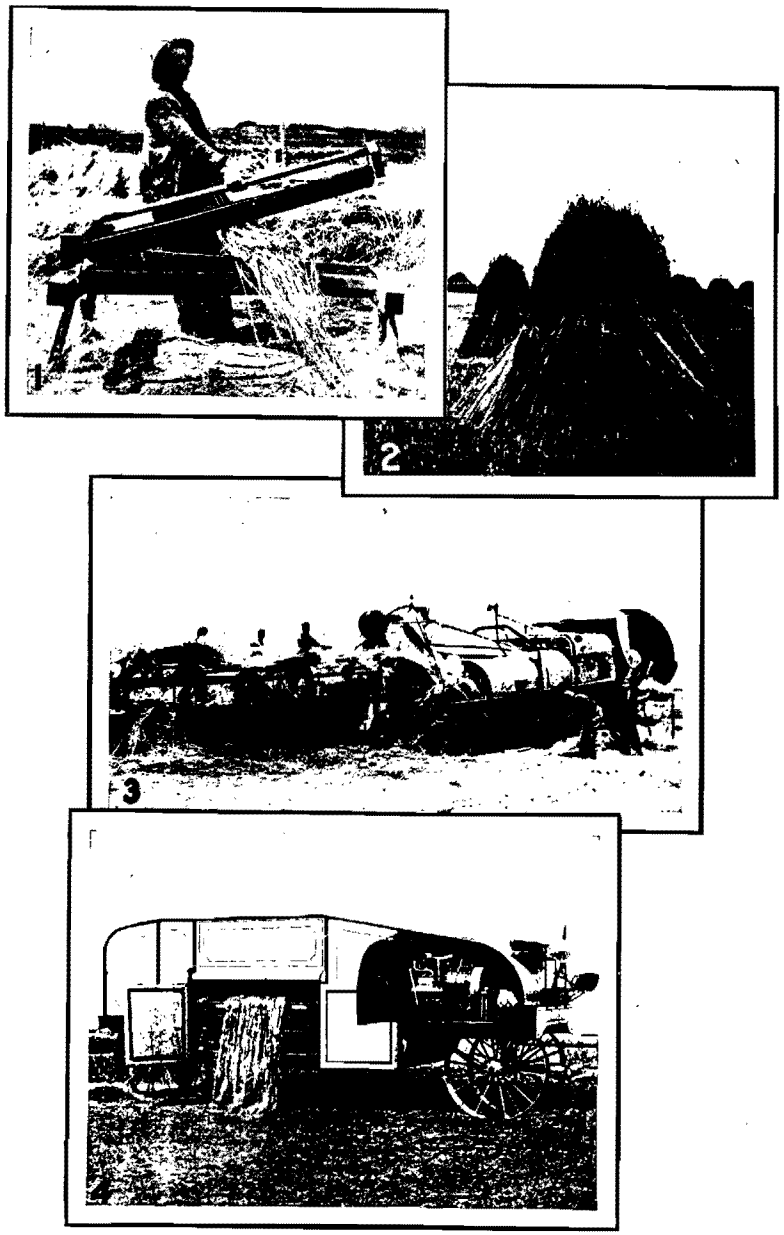
COLLECTING SEED AND RETTING STALKS.

Fig. 1.—Beating off seed from an entire shock of seed hemp. Fig. 2.—Homemade hemp seed-cleaning machine. Fig. 3.—Spreading fiber hemp for retting.



CUTTING HEMP.

Fig. 1.—Cutting hemp by hand, about three-fourths acre per day. Fig. 2.—Self-rake reaper, mostly used; cuts about four acres per day. Fig. 3.—Mowing machine with bar to bend over hemp; cuts about six acres per day.



BREAKING HEMP.

Fig. 1.—The hand brake, cleans about 100 pounds of fiber per day. Fig. 2.—Shock of hemp, tied in bundles for stacking. Fig. 3.—Machine brake which has produced 9,000 pounds of fiber in one day. Fig. 4.—Machine brake which separates and cleans the tow and the line fiber at the same time.

YIELD.

Under favorable conditions the yield of hemp seed ranges from 12 to 25 bushels per acre. From 16 to 18 bushels are regarded as a fair average yield.

COST OF SEED PRODUCTION.

The hemp-seed growers state that it costs about $2.50 per bushel to produce hemp seed, counting the annual rental of the land at about $10 per acre. With the introduction of improved machinery for cleaning the hemp this cost may be somewhat reduced, since it is estimated that with the ordinary methods of rubbing the seed through sieves or beating it to reduce the chaff to finer pieces the cost from beating it off the shock to delivering it at the market is about 50 cents per bushel. These estimates of cost are based on wages at $1.25 per day.

PRICES.

The price of hemp seed, as sold by the farmer during the past 10 years, has ranged from $2.50 to $5 per bushel. The average farm price during this period has been not far from $3 per bushel. Hemp seed is sold by weight, a bushel weighing 44 pounds.

CULTIVATION FOR FIBER.

PREPARATION OF THE LAND.

Fall plowing on most soils is generally regarded as best for hemp, since the action of the frost in winter helps to disintegrate the particles of soil, making it more uniform in character. In practice, hemp land is plowed at any time from October to late seeding time in May, but hemp should never be sown on spring-plowed sod. The land should be plowed 8 or 9 inches in order to give a deep seed bed and opportunity for root development. Plowing either around the field or from the center is recommended, since back furrows and dead furrows will result in uneven moisture conditions and more uneven hemp. Before sowing, the land is harrowed to make a mellow seed bed and uniform level surface. Sometimes this harrowing is omitted, especially when hemp is grown on stubble ground plowed just before seeding. Harrowing or leveling in some manner is recom-

mended at all times, in order to secure conditions for covering the seed at a uniform depth and also to facilitate close cutting at harvest time.

SEEDING.

METHODS OF SEEDING.

Hemp seed should be sown as uniformly as possible all over the ground and covered as nearly as possible at a uniform depth of about three-fourths of an inch, or as deep as 2 inches in light soils. Ordinary grain drills usually plant the seed too deeply and in drills too far apart for the best results. Uniform distribution is sometimes secured by drilling in both directions. This double working, especially with a disk drill, leaves the land in good condition. Ordinary grain drills do not have a feed indicator for hemp seed, but they may be readily calibrated, and this should be done before running the risk of sowing too much or too little. Fill the seed box with hemp seed, spread a canvas under the feeding tubes, set the indicator at a little less than one-half bushel per acre for wheat, and turn the drivewheel as many times as it would turn in sowing one-tenth acre; then weigh the seed that has fallen on the canvas. If the land is to be drilled in both directions, one-half bushel each way, the drill should feed 2.2 pounds for one-tenth acre. One method giving good results is to remove the lower sections of the feeding tubes on grain drills and place a flat board so that the hemp seed falling against it will be more evenly distributed, the seed being covered either by the shoes of the drill or by a light harrow. Good results are obtained with disk drills, roller press drills, and also with the end-gate broadcast seeder. Drills made especially for sowing hemp seed are now on the market, and they are superseding all other methods of sowing hemp seed in Kentucky. Rolling after seeding is advised, in order to pack the soil about the seed and to secure a smooth surface for cutting, but rolling is not recommended for soils where it is known to have an injurious effect.

AMOUNT OF SEED.

Hemp is sown at the rate of about 3 pecks (33 pounds) per acre. On especially rich soil 1½ bushels may be sown with good results, and on poor land that will not support a dense, heavy crop a smaller amount is recommended. If conditions are favorable and the seed germinates 98 to 100 per cent, 3 pecks are usually sufficient.

When kept dry, hemp seed retains its germinative vitality well for at least three or four years, but different lots have been found to vary from 35 to 100 per cent, and it is always well to test the seed before sowing.

TIME OF SEEDING.

In Kentucky, hemp seed is sown from the last of March to the last of May. The best results are usually obtained from April seeding. Later seedings may be successful when there is a plentiful rainfall in June. In Nebraska, hemp seed was sown in April, May, or sometimes as late as June. In California it is sown in February or March; in Indiana and Wisconsin, in May. In general, the best time for sowing hemp seed is just before the time for sowing oats in any given locality.

After the seed is sown, the hemp crop requires no further care or attention until the time of harvest.

HARVEST.

TIME.

In California, hemp is cut late in July or in August; in Kentucky, Indiana, and Wisconsin it is cut in September. The hemp should be cut when the staminate plants are in full flower and the pollen is flying. If cut earlier, the fiber will be finer and softer but also weaker and less in quantity. If permitted to become overripe, the fiber will be coarse, harsh, and less pliable, and it will be impossible to ret the stalks properly.

METHODS OF HARVESTING.

HARVESTING BY HAND.

In Kentucky, a small portion of the hemp crop is still cut by hand with a reaping knife or hemp hook. (Pl. XLV, fig. 1.) This knife is somewhat similar to a long-handled corn cutter. The man cutting the hemp pulls an armful of stalks toward him with his left arm and cuts them off as near the base as possible by drawing the knife close to the ground; he then lays the stalks on the ground in a smooth, even row,

with the butts toward him, that is, toward the uncut hemp. An experienced hand will cut with a reaping knife about three-fourths of an acre a day. The hemp stalks are allowed to lie on the ground until dry, when they are raked up by hand and set up in shocks until time to spread for retting.

HARVESTING WITH REAPERS.

Sweep-rake reapers are being used in increasing numbers for harvesting hemp in Kentucky and in all other localities where hemp is raised. (Pl. XLV, fig. 2.) While not entirely satisfactory, they are being improved and strengthened so as to be better adapted for heavy work. Three men, one to grind sections, one to drive, and one to attend to the machine, and four strong horses or mules are required in cutting hemp with a reaper. Under favorable conditions, from 5 to 7 acres per day can be cut in this manner. This more rapid work makes it possible to harvest the crop more nearly at the proper time. The stalks, after curing in the gavel, are set up in shocks, usually without binding into bundles unless they are to be stacked.

HARVESTING WITH MOWING MACHINES.

In some places hemp is cut with ordinary mowing machines. (Pl. XLV, fig. 3.) A horizontal bar nearly parallel with the cutting bar, the outer end projecting slightly forward, is attached to an upright fastened to the tongue of the machine. This bar is about 4 feet above the cutting bar and about 20 inches to the front. It bends the hemp stalks over in the direction the machine is going. The stalks are more easily cut when thus bent away from the knives and, furthermore, the bases snap back of the cutting bar and never drop through between the guards to be cut a second time, as they often do when cut standing erect. With a 5½-foot mowing machine thus equipped, one man and one team of two horses will cut 6 to 8 acres per day. The work is regarded as about equal to cutting a heavy crop of clover. The hemp thus cut all falls in the direction the machine is going, the tops overlapping the butts of the stalks. The ordinary track clearer at the end of the bar clears a path, so that the stalks are not materially injured either by the horses or the wheels of the machine at the next round.

The hemp stalks are then left where they fall until retted, or in places where the crop is heavy the stalks are turned once or twice to secure uniform curing and retting. When sufficiently retted the stalks are raked up with a 2-horse hay-rake, going crosswise of the swaths, and then drawn, like hay, to the machine brake. This is the most inexpensive method for handling the crop. It is impossible to make clean, long, straight fiber from stalks handled in this manner, and it is not recommended where better methods are practicable. It is worthy of more extended use, however, for handling short and irregular hemp, and hundreds of acres of hemp now burned in Kentucky because it is too short to be treated in the regular manner might be handled with profit by this method. There may be nearly as much profit in 3½-cent fiber produced at a cost of 2 cents per pound as in 5-cent fiber produced at a cost of 3 cents, provided the land rent is not too large an item of cost.

NEED FOR IMPROVEMENT IN HEMP HARVESTERS.

The most satisfactory hemp-harvesting machines now in use are the self-rake reapers, made especially for this purpose. They are just about as satisfactory for hemp now as the similar machines for wheat and oats were 30 years ago. More efficient harvesting machinery is needed to bring the handling of this crop up to present methods in harvesting corn or small grain. A machine is needed which will cut the stalks close to the ground, deliver them straight and not bruised or broken, with the butts even, and bound in bundles about 8 inches in diameter. A modified form of the upright corn binder, arranged to cut a swath about 4 feet wide, is suggested. Modified forms of grain binders have been tried, but with rather unsatisfactory results. Green hemp 8 to 14 feet high can not be handled successfully by grain binders; furthermore, the reel breaks or damages a large proportion of the hemp. The tough, fibrous stalks, some of which may be an inch in diameter, are more difficult to cut than grain and therefore require sharp knives with a high motion.

A hemp-reaping machine is also needed that will cut the hemp and lay it down in an even swath, as grain is laid with a cradle. The butts should all be in one direction, and the swath should be far enough from the cut hemp so as not to

be in the way at the next round. A machine of this type may be used where it is desired to ret the hemp in the fall immediately after cutting. It might be used for late crops in Kentucky, or generally for hemp farther north, where there is little danger of "sunburn" after the hemp is harvested.

STACKING.

Hemp stalks which are to be stacked are bound in bundles about 10 inches in diameter, with small hemp plants for bands, before being placed in shocks. (Pl. XLVI, fig. 2.) They are allowed to stand in the shock from 10 to 15 days, or a sufficient length of time to avoid danger of heating in the stack. The bundles are hauled from the shocks to the stacks in rather small loads of half a ton or less on a low rack or sled. Three men with a team and low wagon to haul the stalks can put up two hemp stacks of about 8 tons each in a day.

A hemp stack must be built to shed water. It is started much like a grain stack with a shock, around which the bundles are placed in tiers, with the butts sloping downward and outward. The stack is kept higher in the center and each succeeding outer tier projects slightly to a height of 5 or 6 feet, when another shock is built in the center, around which the bundles are carefully placed to shed water and the peak capped with an upright bundle. A well-built stack may be kept four or five years without injury.

Hemp which has been stacked rets more quickly and more evenly, the fiber is usually of better quality, and the yield of fiber is usually greater than from hemp retted directly from the shock. Hemp is stacked before retting, but not after retting in Kentucky. Stacking retted hemp stalks for storage before breaking is not recommended in climates where there is danger of gathering moisture. Retted stalks may be stored in sheds where they will be kept dry.

CARE IN HANDLING.

Hemp stalks must be kept straight, unbroken, and with the butts even. They must be handled with greater care than is commonly exercised in handling grain crops. When a bunch of loose stalks is picked up at any stage of the operation, it is chucked down on the butts to make them even. The loose stalks, or bundles, are handled by hand and not

with pitchforks. The only tool used in handling the stalks is a hook or rake, in gathering them up from the swath.

RETTING.

Retting is a process in which the gums surrounding the fibers and binding them together are partly dissolved and removed. It permits the fiber to be separated from the woody inner portion of the stalk and from the thin outer bark, and it also removes soluble materials which would cause rapid decomposition if left with the fiber. Two methods of retting are practiced commercially, viz, dew retting and water retting.

DEW RETTING.

In this country dew retting is practiced almost exclusively. The hemp is spread on the ground in thin, even rows, so that it will all be uniformly exposed to the weather. In spreading hemp the workman takes an armful of stalks and, walking backward, slides them sidewise from his knee, so that the butts are all even in one direction and the layer is not more than three stalks in thickness. (Pl. XLIV, fig. 3.) This work is usually paid for at the rate of $1 per acre, and experienced hands will average more than 1 acre per day. The hemp is left on the ground from four weeks to four months. Warm, moist weather promotes the retting process, and cold or dry weather retards it. Hemp rets rapidly if spread during early fall, provided there are rains, but it is likely to be less uniform than if retted during the colder months. It should not be spread early enough to be exposed to the sun in hot, dry weather. Alternate freezing and thawing or light snows melting on the hemp give most desirable results in retting. Slender stalks one-fourth inch in diameter or less ret more slowly than coarse stalks, and such stalks are usually not overretted if left on the ground all winter. Hemp rets well in young wheat or rye, which hold the moisture about the stalks. In Kentucky most of the hemp is spread during December. A protracted January thaw with comparatively warm rainy weather occasionally results in overretting. While this does not destroy the crop, it weakens the fiber and causes much loss. When retted sufficiently, so that the fiber can be easily separated from the hurds, or woody portion, the stalks are raked up and set up in shocks, care being exercised to keep them straight and with the

butts even. They are not bound in bundles, but a band is sometimes put around the shock near the top. The work of taking up the stalks after retting is usually done by piecework at the rate of $1 per acre.

WATER RETTING.

Water retting is practiced in Italy, France, Belgium, Germany, Japan, and China, and in some localities in Russia. It consists in immersing the hemp stalks in water in streams, ponds, or artificial tanks. In Italy, where the whitest and softest hemp fiber is produced, the stalks are placed in tanks of soft water for a few days, then taken out and dried, and returned to the tanks for a second retting. Usually the stalks remain in the water first about eight days and the second time a little longer.

In either dew retting or water retting the process is complete when the bark, including the fiber, readily separates from the stalks. The solution of the gums is accomplished chiefly by certain bacteria. If the retting process is allowed to go too far, other bacteria attack the fiber. The development of these different bacteria depends to a large extent upon the temperature. Processes have been devised for placing pure cultures of specific bacteria in the retting tanks and then keeping the temperature and air supply at the best for their development.[1] These methods, which seem to give promise of success, have not been adopted in commercial work.

CHEMICAL RETTING.

Many processes for retting or for combined retting and bleaching with chemicals have been devised, but none of them have given sufficiently good results to warrant their introduction on a commercial scale. In most of the chemical retting processes it has been found difficult to secure a soft, lustrous fiber, like that produced by dew or water retting, or completely to remove the chemicals so that the fiber will not continue to deteriorate owing to their injurious action.

One of the most serious difficulties in hemp cultivation at the present time is the lack of a satisfactory method of retting that may be relied upon to give uniform results without injury to the fiber. An excellent crop of hemp stalks, capable of yielding more than $50 worth of fiber per acre, may be practically ruined by unsuitable weather conditions while retting. Water retting, although less dependent on weather conditions than dew retting, has not thus far given profitable results in this country. The nearest approach to commercial success with water retting in recent years in America was attained in 1906 at Northfield, Minn., where, after several years of experimental work, good fiber, similar to Italian hemp in quality, was produced from hemp retted in water in large cement tanks. The water was kept in circulation and at the desired temperature by a modification of the Deswarte-Loppens system.

[1] Rossi, Giacomo. Macerazione della Canapa. Annali della Regia Scuola Superiore di Agricultura di Portici, s. 2, v. 7, p. 1–148, 1907.

STEAMING.

In Japan, where some of the best hemp fiber is produced, three methods of retting are employed—dew retting, water retting, and steaming, the last giving the best results. Bundles of hemp stalks are first immersed in water one or two days to become thoroughly wet. They are then secured vertically in a long conical box open at the bottom and top. The box thus filled with wet stalks is raised by means of a derrick and swung over a pile of heated stones on which water is dashed to produce steam. Steaming about three hours is sufficient. The fiber is then stripped off by hand and scraped, to remove the outer bark. The fiber thus prepared is very strong, but less flexible than that prepared by dew retting or water retting.

BREAKING.

Breaking is a process by means of which the inner, woody shell is broken in pieces and removed, leaving the clean, long, straight fiber. Strictly speaking, the breaking process merely breaks in pieces the woody portions, while their removal is a second operation properly called *scutching*. In Italy and in some other parts of Europe the stalks are broken by one machine, or device, and afterwards scutched by another. In this country the two are usually combined in one operation.

HAND BRAKES.

Hand brakes (Pl. XLVI, fig. 1), with little change or modification, have been in use for many generations, and even yet more than three-fourths of the hemp fiber produced in

Kentucky is broken out on the hand brake. This simple device consists of three boards about 5 feet long set edgewise, wider apart at one end than the other and with the upper edges somewhat sharpened. Above this a framework, with two boards sharpened on the lower edges, is hinged near the wide end of the lower frame, so that when worked up and down by means of the handle along the back these upper boards pass midway in the spaces between the lower ones. A carpenter or wagon maker can easily make one of these hand brakes, and they are sold in Kentucky for about $5.

The operator takes an armful of hemp under his left arm, places the butts across the wide end of the brake near the hinged upper part, which is raised with his right hand, and crunches the upper part down, breaking the stalks. This operation is repeated several times, moving the stalks along toward the narrow end so as to break the shorter pieces, and when the hemp appears pretty well broken the operator takes the armful in both hands and whips it across the brake to remove the loosened hurds. He then reverses the bundle and breaks the tops and cleans the fiber in the same manner.

The usual charge for breaking hemp on the hand brake in this manner is 1 cent to 1½ cents per pound. There are records of 400 pounds being broken by one man in a day, but the average day's work, counting six days in a week, is rarely more than 75 pounds. In a good crop, therefore, it would require 10 to 15 days for one man to break an acre of hemp. The work requires skill, strength, and endurance, and for many years there has been increasing difficulty in securing laborers for it. It is plainly evident that the hemp industry can not increase in this country unless some method is used for preparing the fiber requiring less hand labor than the hand brake.

MACHINE BRAKES.

Several years ago a brake was built at Rantoul, Ill., for breaking and cleaning the fiber rapidly, but producing tow or tangled fiber instead of clean, straight, line fiber, such as is obtained by the hand brake. This machine consisted essentially of a series of fluted rollers followed by a series of beating wheels. Machines designed after this type, but improved in many respects, have been in use several years at Havelock, Nebr., and first at Gridley, then at Courtland and Rio Vista,

Cal. These machines have sufficient capacity and are operated at comparatively small cost, the hurds furnishing more than sufficient fuel for the steam power required, but the condition of the fiber produced is not satisfactory for high-class twines and it commands a lower price than clean, long, straight fiber.

The Sanford-Mallory flax brake, consisting essentially of five fluted rollers with an interrupted motion, producing a rubbing effect, has been used to a limited extent for breaking hemp. This machine, as ordinarily made for breaking flax, is too light and its capacity is insufficient for the work of breaking hemp.

A portable machine brake (Pl. XLVI, fig. 4) has been used successfully in Kentucky during the past two years. It has a series of crushing and breaking rollers, beating and scutching devices, and a novel application of suction to aid in separating hurds and tow. The stalks are fed endwise. The long fiber, scutched and clean, leaves the machine at one point, the tow, nearly clean, at another, and the hurds, entirely free from fiber, at another. It has a capacity of about 1 ton of clean fiber per day.

Another portable machine brake has been in use in California during the past two years, chiefly breaking hemp that has been thoroughly air dried but not retted. This hemp, grown with irrigation, becomes dry enough in that arid climate to break well, but this method is not practicable in humid climates without artificial drying. The stalks, fed endwise, pass first through a series of fluted or grooved rollers and then through a pair of beating wheels, removing most of the hurds, and the fiber, passing between three pairs of moving scutching aprons, each pair followed by rollers, finally leaves the machine in a kind of continuous lap folded back and forth in the baling box.

A larger machine (Pl. XLVI, fig. 3), having the greatest capacity and turning out the cleanest and most uniform fiber of any of the brakes thus far brought out, has been used to a limited extent during the past eight years in Kentucky, California, Indiana, and Wisconsin. This machine weighs about 7 tons, but it is mounted on wheels and is drawn about by a traction farm engine, which also furnishes power for operating it. The stalks are fed sidewise in a continuous layer 1 to 3 inches thick, and carried along so that the ends,

forced through slits, are broken and scutched simultaneously by converging revolving cylinders about 12 and 16 feet long. One cylinder, extending beyond the end of the other, cleans the middle portion of the stalks, the grasping mechanism carrying them forward being shifted to the fiber cleaned by the shorter cylinder. The cylinders break the stalks and scutch the fiber on the under side of the layer as it is carried along, and the loosened hurds on the upper side are scutched by two large beating wheels just as it leaves the machine. The fiber leaves the machine sidewise, thoroughly cleaned and ready to be twisted into heads and packed in bales. This machine with a full crew of 15 men, including men to haul stalks from the field and others to tie up the fiber for baling, has a capacity of 1,000 pounds of clean, straight fiber of good hemp per hour. The tow is thrown out with the hurds, and until recent improvements it has produced too large a percentage of tow. It does good work with hemp retted somewhat less than is necessary for the hand brake, and it turns out more uniform and cleaner fiber. For good work it requires, as do all the machines and also the hand brakes, that the hemp stalks be dry. If the atmosphere is dry at the time of breaking, the hemp may be broken directly from the shocks in the field, but in regions with a moist atmosphere, or with much rainy weather, it would be best to store the stalks in sheds or under cover, and with a stationary plant it might be economical to dry them artificially, using the hurds for fuel. Extreme care must be exercised in artificial drying, however, to avoid injury to the fiber.

IMPROVEMENT NEEDED IN HEMP-BREAKING MACHINES.

While hemp-breaking machines have now reached a degree of perfection at which they are successfully replacing the hand brakes, as the thrashing machines half a century ago began replacing the flail, there is still room for improvement. This needed improvement may be expected as soon as hemp is grown more extensively, so as to make a sufficient demand for machinery to induce manufacturers to invest capital in this line. For small and scattered crops a comparatively light, portable machine is desirable, requiring not more than 10 horsepower and not more than four or five laborers of

average skill for its operation. It should prepare the fiber clean and straight, ready to be tied in hanks for baling, and should have a capacity of at least 1,000 pounds of clean fiber per day. For localities where hemp is grown more abundantly, so as to furnish a large supply of stalks within short hauling distance, a larger machine operated in a stationary central plant by a crew of men trained to their respective duties, like workers in a textile mill, will doubtless be found more economical. Artificial retting and drying may also be used to good advantage in a central plant.

The hemp growers of Europe have adopted machine brakes more readily than the farmers in this country, and the hemp industry in Europe is most flourishing and most profitable where the machines are used. Most of the hemp in northern Italy is broken and scutched by portable machines. Machines are also used in Hungary, and the machine-scutched hemp of Hungary is regularly quoted at $10 to $15 per ton higher than that prepared by hand. These European machines may not be adapted to American conditions, but, together with American machines which are doing successful work, they sufficiently contradict the frequent assertion of hemp growers and dealers that "no machine can ever equal the hand brake."

SORTING.

On many hemp plantations the stalks are roughly sorted before breaking, so that the longer or better fiber will be kept separate. The work of sorting can usually be done best at this point, short stalks from one portion of a field being kept separate from the longer stalks of another portion and overretted stalks from stalks with stronger fiber. Sometimes the men breaking the hemp sort the fiber as it is broken. An expert handler of fiber will readily sort it into two or three grades by feeling of it as it leaves the hand brake or the breaking machine. It is a mistaken policy to suppose that the average price will be higher if poor fiber is mixed with good. It may be safely assumed that the purchaser fixing the price will pay for a mixed lot a rate more nearly the value of the lowest in the mixture, and he can not justly do otherwise, for the fiber must be sorted later if it is to be used to the best advantage in the course of manufacture.

PACKING FIBER FOR LOCAL MARKET.

The long, straight fiber is put up in bundles, or heads, 4 to 6 inches in diameter and weighing 2 to 4 pounds. (Pl. XL, fig. 4.) The bundle of fiber is twisted and bent over, forming a head about one-third below the top end. It is fastened in this form by a few strands of the fiber itself, wound tightly around the neck and tucked in so that it may be readily unfastened without cutting or becoming tangled. Three ropes, each about 15 feet long, twisted by hand from the hemp tow, are stretched on the ground about 15 inches apart. The hanks of fiber are piled crosswise on these ropes with the heads of the successive tiers alternating with the loose ends, which are tucked in so as not to become tangled. When the bundle thus built up is about 30 inches in diameter, the ropes are drawn up tightly by two men and tied. These bundles weigh about 200 pounds each. Most of the hemp leaves the farm in this form. Hemp tow, produced from broken or tangled stalks and fiber beaten out in cleaning the long straight hemp, is packed into handmade bales in the same manner.

HACKLING.

In Kentucky, most of the hemp is sold by the farmers to the local dealers or hemp merchants. The hemp dealers have large warehouses where the fiber is stored, sorted, hackled, and baled. The work of hackling is rarely done on the farms. The rough hemp is first sorted by an expert, who determines which is best suited for the different grades to be produced. A quantity of this rough fiber, usually 112 or 224 pounds, is weighed out to a workman, who hackles it by hand, one head at a time. The head is first unfastened and the fiber shaken out to its full length. It is then combed out by drawing it across a coarse hackle, beginning near the top end and working successively toward the center. When combed a little beyond the center, the bundle of fiber is reversed and the butt end hackled in the same manner. The coarse hackle first used consists of three or four rows of upright steel pins about 7 inches long, one-fourth of an inch thick, and 1 inch apart. The long fiber combed out straight on this hackle is called "single-dressed hemp." This may afterwards be treated in much the same manner on a smaller

hackle with finer and sharper needles set closer together, splitting and subdividing the fibers as well as combing them out more smoothly. The fiber thus prepared is called "double-dressed hemp," and it commands the highest price of any hemp fiber on the American market.

The work of hackling is paid for at a certain rate per pound for the amount of dressed fiber produced. The workman therefore tries to hackle and dress the fiber in such a manner as to produce the greatest possible amount of dressed fiber and least amount of tow and waste. The dressed fiber is carefully inspected before payment is made, and there are few complaints from manufacturers that American dressed hemp is not up to the standard.

A large proportion of the hemp purchased by the local dealers is sold directly to the twine and cordage mills without hackling or other handling except carefully sorting and packing into bales.

BALING.

The bales packed for shipment are usually about 4 by 3 by 2 feet. The following table gives the approximate weights per bale:

Average weight per bale of hemp for shipment to mills.

Class of hemp.	Pounds.
Tow	450
Rough	500
Single dressed	800
Double dressed	900

When cleaned by machine brakes the fiber is often baled directly without packing it in the preliminary handmade bales. In this way it has sometimes escaped the process of careful sorting and has brought unjust criticism on the machines. This cause for criticism may easily be avoided by exercising a little more care in sorting the stalks, and, if necessary, the cleaned fiber.

YIELD.

The yield of hemp fiber ranges from 400 to 2,500 pounds per acre. The average yield under good conditions is about 1,000 pounds per acre, of which about three-fourths are line

fiber and one-fourth is tow. The yield per acre at different stages of preparation may be stated as follows:

Stalks:	Pounds.
Green, freshly cut	15,000
Dry, as cured in shock	10,000
Dry, after dew retting	6,000
Long fiber, rough hemp	750
Tow	250

If the 750 pounds of long fiber is hackled it will yield about 340 pounds of single-dressed hemp, 180 pounds shorts, 140 pounds fine tow, and 90 pounds hurds and waste.

The average yields in the principal hemp-producing countries of Europe, based on statements of annual average yields for 5 to 10 years, are as follows:

	Pounds.
Russia	358
Hungary	504
Italy	622
France	662

The yield is generally higher in both Europe and the United States in regions where machine brakes are used, but this is due, in part at least, to the better crops, for machine brakes usually accompany better farming.

COST OF HEMP-FIBER PRODUCTION.

The operations for raising a crop of hemp are essentially the same as those for raising a crop of wheat or oats up to the time of harvest, and the implements or tools required are merely a plow, disk, drill or seeder, a harrow, and a roller, such as may be found on any well-equipped farm. Estimates of the cost of these operations may therefore be based upon the cost of similar work for other crops with which all farmers are familiar. But the operations of harvesting, retting, breaking, and baling are very different from those for other farm crops in this country. The actual cost will, of course, vary with the varying conditions on different farms.

Hemp can not be economically grown in areas of less than 50 acres in any one locality so as to warrant the use of machinery for harvesting and breaking. The following general estimate is therefore given for what may be considered the smallest practical area:

Estimated cost and returns for 50 acres of hemp.

Cost:	
Plowing (in fall) 50 acres, $2 per acre	$100
Disking (in spring), 50 cents per acre	25
Harrowing, 30 cents per acre	15
Seed, 40 bushels, delivered, $4.50 per bushel	180
Seeding, 40 cents per acre	20
Rolling, 30 cents per acre	15
Self-rake reaper for harvesting	75
Cutting with reaper, $1 per acre	50
Picking up from gavels and shocking, $1 per acre	50
Spreading for retting, $1.50 per acre	75
Picking up from retting swath and setting in shocks, $1.40 per acre	70
Breaking 50,000 pounds fiber, including use of machine brake, 1½ cents per pound	750
Baling 125 bales (400 pounds each), including use of baling press, $1.40 per bale	175
Marketing and miscellaneous expenses	150
Total cost	1,750
Returns:	
Long fiber, 37,500 pounds, 6 cents per pound	2,250
Tow, 12,500 pounds, 4 cents per pound	500
Total returns	2,750

It is not expected that a net profit of $20 per acre, as indicated in the foregoing estimate, may be realized in all cases, but the figures given are regarded as conservative where all conditions are favorable.

MARKET.

All of the hemp produced in this country is used in American spinning mills, and it is not sufficient to supply one-half of the demand. The importations have been increasing slightly during the past 20 years, while there has been a decided increase in values. The average declared value of imported hemp, including all grades, for the 4,817 tons imported in 1893, was $142.31 per ton, while in the fiscal year 1913 the importations amounted to 7,663 tons with an average declared value of $193.67 per ton. There have been some fluctuations in quotations, but the general tendency of prices of both imported and American hemp has been upward. (Fig. 19.) The quotations for Kentucky rough prime, since October, 1912, have been the highest recorded for this standard grade. Furthermore, the increasing

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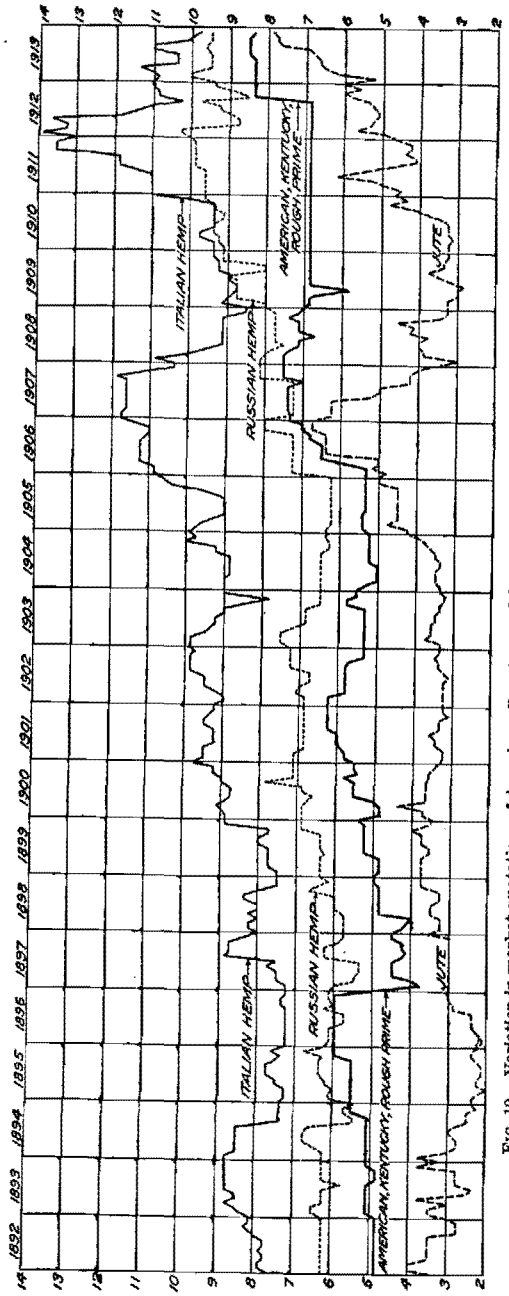


FIG. 19.—Variation in market quotations of American, Russian, and Italian hemp, and also of a standard high grade of jute.

demand for this fiber, together with the scarcity of competing fibers in the world's markets, indicates a continuation of prices at high levels.

EFFECT OF TARIFF.

So far as can be determined from records of importations and prices since 1880, the earliest available statistics, the changes in the rate of import duty on hemp have had no appreciable effect on the quantity imported, on the declared import value [1] of the fiber, or on the quantity produced or the price of American hemp in this country. (Fig. 20.) The tariff acts of 1870, 1883, and 1890, in force until 1894, imposed a duty of $25 per ton on line hemp. From 1894 to 1899 hemp was on the free list, and from 1899 to 1913 it was dutiable at $22.50 per ton.

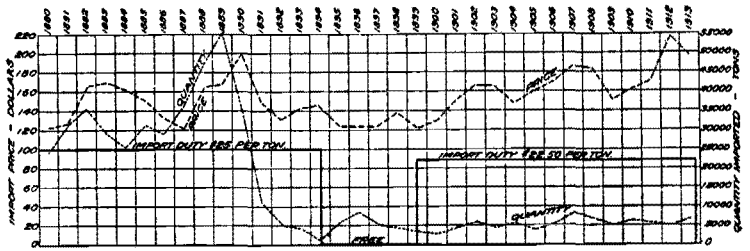


FIG. 20.—Importations and average import price of hemp for 33 years, together with changes in the rate of import duty.

The importations reached a high level in 1899, when hemp was extensively used for binder twine. From that year onward henequen from Yucatan and abacá from the Philippines replaced hemp in binder twine, while jute from India replaced it completely for cotton-bale covering. The increasing demand for hemp for commercial twines has resulted in higher prices for both imported and American hemps, but this demand has been met in this country neither by importation nor by production. There are no accurate statistics of acreage or production in the United States, but there has been a general decline from about 7,000 tons in 1880 to about 5,000 in 1913. The average annual production during the period of free importations, 1894 to 1899, was about 5,000 tons, but slightly less than that of the previous 10

[1] Declared value at port of shipment.

years and about the same as the average of the period of dutiable hemp since then.

The present tariff, 1913, with hemp on the free list, has not been in force long enough to indicate any appreciable effect.

LOCATION OF AMERICAN MILLS.

Some hemp from the larger farms is sold directly to the spinning mills, but most of that produced in this country passes through the hands of local dealers in Kentucky. The hemp imported is purchased either directly from foreign dealers by the mills or through fiber brokers in New York and Boston.

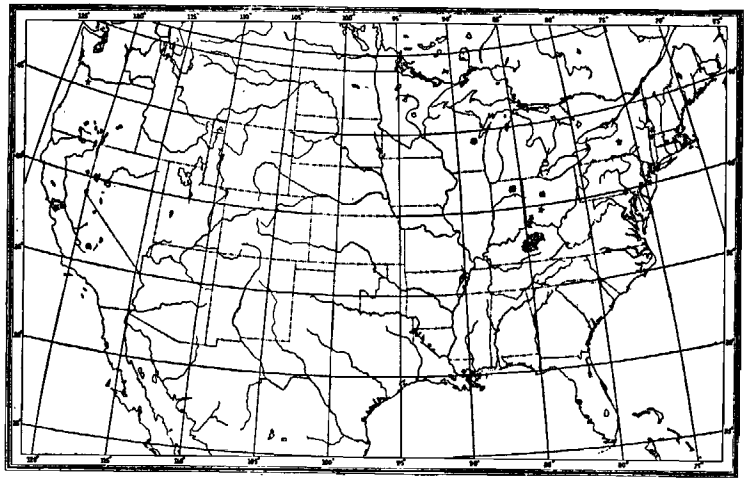


FIG. 21.—Map showing areas (shaded) of hemp cultivation and location (*) of hemp spinning mills in the United States.

There is one twine mill at Frankfort, Ky., on the western edge of the hemp-producing region, and one at Covington, Ky., opposite Cincinnati, but aside from the comparatively small quantities used by these mills and a little used in the mill at Oakland, Cal., practically all the hemp fiber is shipped away from the States where it is produced. There are 28 mills in this country using American hemp, most of them in the vicinity of Boston or New York, as indicated on the accompanying map[1] (fig 21). In most of these mills other soft fibers, such as jute, China jute, and flax, are also used,

[1] Some of the mills are so close together around New York and Boston that it is impossible to indicate each one by a separate star.

and many of them are also engaged in the manufacture of twines and cordage from the hard fibers—sisal, henequen, abacá (manila), phormium, and Mauritius.

USES.

Hemp is used in the manufacture of tying twine, carpet warp, seine twine, sails, standing rigging, and heaving lines for ships, and for packing. It has been used to some extent for binder twine, but at the relative prices usually prevailing it can not well compete with sisal and abacá for this purpose. Binder twine made of American hemp and India jute mixed has been placed upon the market. This twine is said to give excellent results because it is more smooth and uniform than twine made of hard fiber. The hemp fiber is tougher and more pliable than hard fibers, and the twine is therefore more difficult to cut in the knotter. Hemp is also used to a limited extent for bagging and cotton baling. Only the tow and cheaper grades of the fiber can compete with other fibers for these purposes. The softer grades of hemp tow are extensively used for oakum and packing in pumps, engines, and similar machinery. It endures heat, moisture, and friction with less injury than other fibers, except flax, used for these purposes. Hemp is especially adapted by its strength and durability for the manufacture of carpet warp, hall rugs, aisle runners, tarpaulins, sails, upholstery webbing, belt webbing, and for all purposes in textile articles where strength, durability, and flexibility are desired. Hemp will make fabrics stronger and more durable than cotton or woolen fabrics of the same weight, but owing to its coarser texture it is not well suited for clothing and for many articles commonly made of cotton and wool.

COMPETING FIBERS.

The principal fibers now competing with American-grown hemp are Russian and Hungarian hemp, cotton, and jute. Italian hemp, being water retted, is not only higher in price but it is different in character from the American dew-retted hemp, and it is used for certain kinds of twines and the finer grades of carpet warp for which American hemp is not well suited. Twine made of Italian hemp may, of course, be used sometimes where American hemp twine might serve just as well, but owing to its higher price it is not likely to be used

as a substitute, and it can not compete to the disadvantage of American hemp.

Russian and Hungarian hemp, chiefly dew retted, is of the same character as American hemp and is used for the same purposes. Russian hemp is delivered at the mills in this country at prices but little above those of rough hemp from Kentucky. Most of the Russian and Hungarian hemp imported is of the better grades, the poorer grades being retained in Europe, where many articles are made of low-grade hemp that would be made of low-grade cotton in this country.

In some years, owing to unsuitable weather conditions for retting Kentucky hemp or to greater care in handling Russian hemp and to care in grading the hemp for export from Russia, much of the Russian hemp of the better grades has been stronger and more satisfactory to twine manufacturers than American hemp placed on the market at approximately the same price. It is used for mixing with overretted and weak American hemp to give the requisite strength to twine.

Cotton is now used more extensively than all other vegetable fibers combined. The world's supply of cotton is estimated in round numbers at 5,500,000 tons, valued at nearly $1,000,000,000. The total supply of all other fibers of commerce—hemp, flax, jute, China jute, ramie, sisal, abacá, phormium, Mauritius fiber, cabuya, mescal fiber, and Philippine maguey—amounts annually to about 3,300,000 tons, valued at about $350,000,000. Cotton, therefore, so greatly overshadows all other textile fibers that it may scarcely be regarded as competing directly with any one of them. Cotton is prepared and spun on different kinds of machines from those used for preparing and spinning long fibers. Cotton is not mixed with hemp and is rarely spun in the same mills where hemp is used. Cotton twines do, however, compete with hemp tying twines, and cotton is largely used for carpet warp, where hemp, with its superior strength and durability, would give better service. Less than a century ago hemp and flax were used more extensively than cotton, but the introduction of the cotton gin, followed by the rapid development of machinery all along the line for preparing and spinning cotton fiber, while there has been no corresponding development in machinery for preparing and spinning hemp or other long fibers, has given cotton the supremacy among vegetable fibers. There is little probability that hemp will regain

the supremacy over cotton, even with improved machinery for handling the crop and spinning the fiber, because cotton is better adapted to a wide range of textile products. Hemp should, however, regain many of the lines where it will give better service than cotton.

Jute is the most dangerous competitor of hemp. Jute is produced in India from the bast or inner bark of two closely related species of plants, jute (*Corchorus capsularis*) and nalta jute (*Corchorus olitorius*). These plants are somewhat similar in appearance to hemp, though not at all related to it. They are grown on the alluvial soils in the province of Bengal, India, and to a much less extent in other parts of India, southern China, and Taiwan (Formosa). More than 3,000,000 acres are devoted to this crop, and the annual production is approximately 2,000,000 tons of fiber, valued at $150,000,000. The plants are pulled by hand, water retted in slow streams or stagnant pools, and the fiber cleaned by hand without the aid of even crude appliances as effective as the hand brake for hemp. Jute fiber thus prepared, cleaner, softer, and more easily spun than Kentucky rough-prime hemp, is delivered in New York at an average price of about 4 cents per pound for the better grades. Jute butts, consisting of the coarser fiber cut off at the base, 5 to 10 inches long, are sold in this country at 1 to 2 cents per pound. Most of the long jute fiber comprising the "light jute" grades are of a light straw color, while the "dark jutes," also called "desi jute," are of a dark, brownish gray. The fresh fiber of both kinds when well prepared is lustrous, but with age it changes to a dingy, brownish yellow.

Fresh jute fiber is about two-thirds as strong as hemp fiber of the same weight, but jute lacks durability and rapidly loses its strength even in dry air, while if exposed to moisture it quickly goes to pieces. It is not suitable for any purpose where strength or durability is required.

Jute is used most extensively for burlaps, gunny bags, sugar sacks, grain sacks, wool sacking, and covering for cotton bales. Hemp has been used for all of these purposes, but the cheaper jute fiber now practically holds the entire field in the manufacture of coverings for agricultural products in transit. This is a legitimate field for jute, where it constitutes a "gift package," generally to be used but once, but even in this field hemp may regain some of its uses where it is found that jute does not give sufficient strength or durability.

Jute is often used as an adulterant or as a substitute for hemp in the manufacture of twines, webbing, carpet warp, and carpets. The careless use of the name hemp to indicate jute aids in facilitating this substitution. Twine made of pure jute fiber is sold as "hemp twine" in the retail stores in Lexington, Ky., in the heart of the hemp-growing region. Many of the so-called hemp carpets and hemp rugs are made only of jute, and they wear out quickly, whereas a carpet made of hemp should be as durable as one made of wool. Jute is substituted for hemp very largely in the manufacture of warp for carpets and rugs, a purpose for which its lack of strength and durability makes it poorly fitted. It is to the interest of the purchaser of manufactured articles as well as to the producer of hemp and the manufacturer of pure hemp goods that the line between hemp and jute be sharply drawn. Unfortunately, the difference in the appearance of the fibers by which they may be distinguished is not as strongly marked as the differences between their strength and wearing qualities.

TESTS FOR DISTINGUISHING BETWEEN JUTE AND HEMP.

There are no satisfactory tests for these fibers without the aid of a microscope and chemical reagents. A ready, but uncertain, test consists in untwisting the end of twine or yarn. Jute fiber thus unwound is more fuzzy and more brittle than hemp. The two fibers may be distinguished with certainty with a microscope and chemical reagents, as indicated by the differences in the table which follows:

Reactions of hemp and jute.[1]

Test.	Hemp.	Jute.
Schweitzer's	Clean fiber dissolved.	Bluish color, more or less distinct swelling.
Iodin and sulphuric acid	Greenish blue to pure blue.	Yellow to brown.
Anilin sulphate	Faint yellow	Golden yellow to orange.
Warming in weak solution of nitric acid and potassium chromate, then washing and warming in dilute solution of soda ash and washing again; place on microscopic slide, and when dry add drop of glycerol. Use polariscope (dark field).	Uniform blue or yellow.	Prismatic colors.

[1] Matthews, J. Merritt. The Textile Fibers, p. 349, 1908.

At the present high prices of jute (fig. 4), resulting from increasing demands in foreign markets and a partial failure of the crop in India, jute could not compete successfully with hemp were it not that manufacturers are using it in established lines of goods, and, further, that they are uncertain about securing supplies of hemp.

SUMMARY.

Hemp is one of the oldest fiber-producing crops and was formerly the most important.

The cultivation of hemp is declining in the United States because of the (1) increasing difficulty in securing sufficient labor for handling the crop with present methods, (2) lack of labor-saving machinery as compared with machinery for handling other crops, (3) increasing profits in other crops, (4) competition of other fibers, especially jute, and (5) lack of knowledge of the crop outside of a limited area in Kentucky.

Hemp was cultivated for fiber in very early times in China.

The history of the distribution of hemp from Asia to other continents indicates its relationships and the development of the best fiber-producing types.

Hemp is cultivated in warm countries for the production of a narcotic drug, but for fiber only in moderately cool and humid temperate regions.

Very few well-marked varieties of hemp of fiber-producing types have been developed.

The climate and soils over large areas in the valley of the Mississippi and its tributaries and in the Sacramento and San Joaquin Valleys in California are suited for hemp.

Hemp improves the physical condition of the soil, destroys weeds, and when retted on the ground, as is the common practice, does not exhaust fertility.

Hemp is recommended for cultivation in regular crop rotations to take the place of a spring-sown grain crop.

Fertilizers are not generally used in growing hemp, but barnyard manure applied to previous crops is recommended.

Hemp is rarely injured by insects or fungous diseases.

Broom rape, a root parasite, is the most serious pest in hemp.

Practically all of the hemp seed used in the United States is produced in Kentucky.

The best seed is obtained from plants cultivated especially for seed production, but some seed is obtained from broadcast overripe fiber crops.

The land should be well plowed and harrowed, so as to be level and uniform.

The seed should be sown early in spring by any method that will distribute and cover it uniformly.

Some hemp is still cut by hand in Kentucky, but the use of machinery for harvesting the crop is increasing.

Dew retting is regarded as the most practical method in this country.

Hand brakes for preparing the fiber are still used, but they are being replaced by machines.

The price of hemp has been generally increasing during the past 30 years.

About 30 different spinning mills in the United States, beside dealers in oakum supplies, offer a market for raw hemp fiber.

The market would expand if manufacturers could be assured of larger supplies.

India jute, often retailed under the name hemp, is the most dangerous competitor of hemp.

THE SOUTH AMERICAN MEAT INDUSTRY.

By A. D. Melvin,
Chief of the Bureau of Animal Industry.

IT is well known that the domestic supply of meat in the United States, especially of beef, has in recent years shown an alarming decrease, so much so, in fact, that for the first time in our history it has become necessary to look to the foreign field for relief. Certain distant countries, having sparse populations and vast herds and flocks combined with abundant natural grazing facilities, have now taken the place of the United States as the world's great source of the meat surplus. South America and the Australian colonies, particularly the former, have in the last decade produced immense quantities of beef and mutton for export, and already shipments have been received in our ports from these places, mostly of beef from Argentina, with a probability that the trade will soon grow to considerable proportions. In view of these facts, and pursuant to the instructions of the Secretary of Agriculture, an investigation of the South American meat inspection and meat industry was made by the writer in the late summer of 1913, the results of which, together with the main facts connected with live-stock conditions and the meat trade of the South American countries, are herewith given.

The investigation was undertaken primarily for the purpose of ascertaining at first hand whether the meat inspection was adequate and whether the conditions under which food animals were slaughtered and the meat prepared for export were such as would reasonably insure that the product was sound and healthful, as is required by our laws. To dispose of this point at the outset it may be stated that the official inspection of meat for export, as observed at the various establishments engaged in this trade, was on the whole satisfactory. Some more or less important details, however, were not in accordance with the practice of the Federal meat inspection as administered by this bureau, but in this connection it should

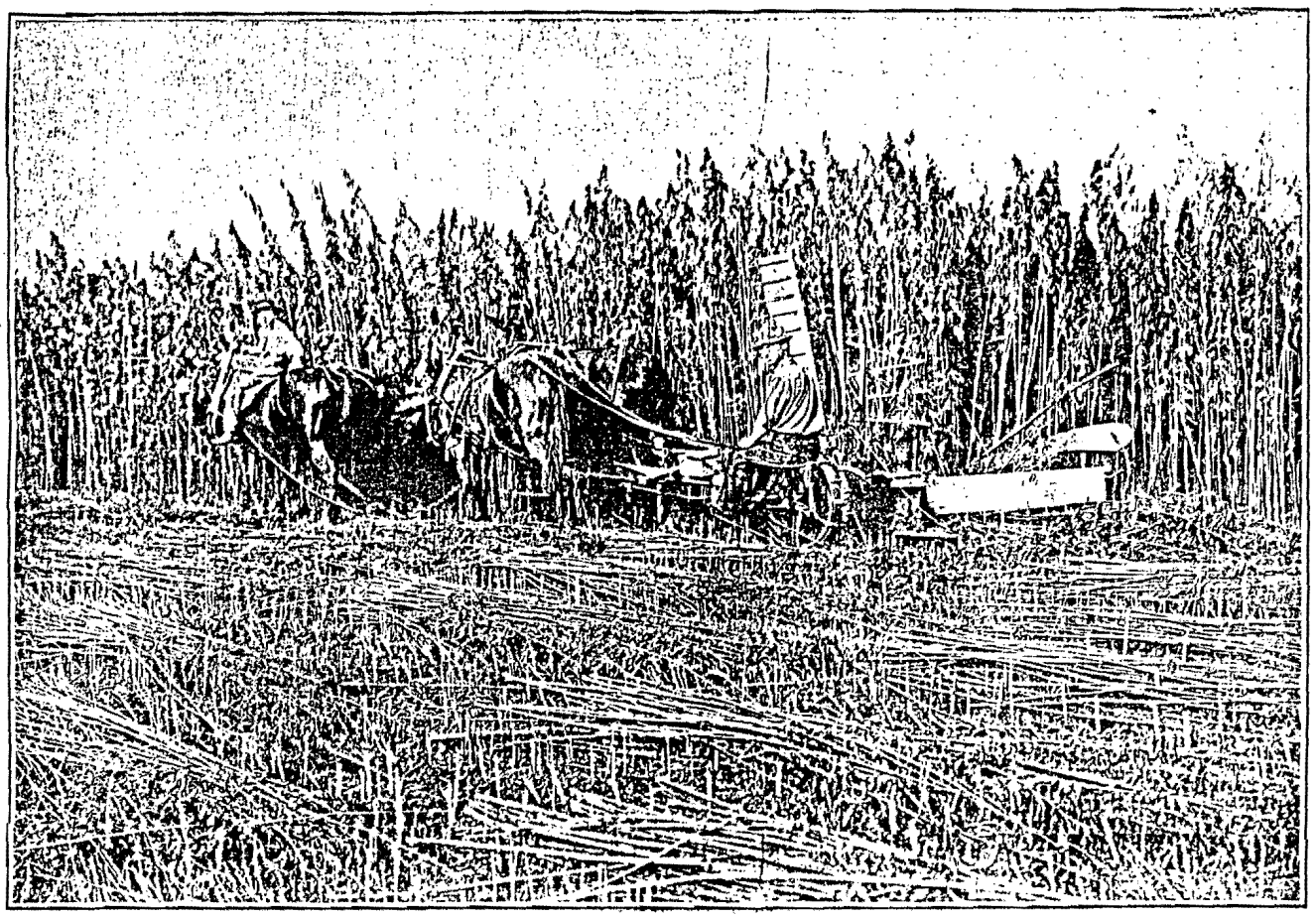


Fig. 1.—Harvesting hemp on an Indiana farm.

Growing Hemp in America

Facts Relating to Its Culture, Qualities and Preparation

By Charles Richards Dodge

If there was ever a time when hemp culture in the United States ought to pay it is the present, as owing to the war in Europe the foreign supply has been considerably curtailed, and prices of all grades have been greatly increased. Our imports of this fiber are derived chiefly from Russia and Italy, the Italian hemp being a high grade, almost white, fiber of superior strength—in fact, the finest hemp produced in the world—and of which this country has taken as high as 4,000 tons in a year. The fiber imported from Russia is of lower grade, darker in color, not so carefully prepared, and of less tensile strength than the Italian, but well adapted to certain lines of American manufacture. The hemp grown in this country is, for the most part, quite inferior to that imported, being a very dark slaty gray in color, and more roughly prepared, but at the same time very strong and adapted to the manufacture of coarse twines and small cordage, for which it is largely employed.

In recent years the American culture has greatly declined, although between 50 and 60 years ago we produced in a year as high as 75,000 tons. But that was before the era of Manila hemp and jute, when common hemp was used for the manufacture of bagging—for baling the cotton crop—burlap, marine and other cordage, even clothing, and other lines. The importation of Manila hemp in increasing quantities started the decline, but the admission of jute butts, free of duty, in 1872, finished the business and drove every hemp mill out of existence. The production of hemp fell to 12,000 tons a year, and in recent years the production has fallen to 5,000 tons or less. Last season's crop is said to have been under 1,000 tons.

While our hemp imports are limited to the fiber of only two or three countries, the plant is almost universally grown. A native of central and western Asia, it has been carried by cultivation into all temperate and tropical climates. It is cultivated in central and southern Russia, Hungary, Germany, France and Italy, and in many portions of Asia—India especially, where it thrives at an elevation of 4,000 to 10,000 feet—and in China and Japan. It is found on both the east and west coasts of Africa, and it has been introduced into Victoria. It is as widely cultivated in the Western Hemisphere, and has been naturalized in South America north of Rio Janeiro. In the United States the culture has been carried on chiefly in Kentucky, Indiana, Illinois, Missouri, Minnesota and California, though the main supply has been produced in the first named State, where the plant has been cultivated for a century. Last year's crop is said to have been the smallest on record, owing, it is claimed, to tariff changes, and in Kentucky to the fact that there is more money in tobacco raising—the low prices that have ruled making the culture unprofitable.

Prices have ranged from 3½ cents to 6 cents per pound, Russian hemp bringing 7 and 8 cents, with a supply equal to any demand. Now that the American supply is next to nothing, the foreign supply curtailed, and prices soaring—a fair grade of imported fiber bringing 12 cents per pound—it would seem worth while for American growers, especially in Kentucky where the culture is so well understood, to put in an extra crop this year, and pocket the proceeds.

If the European war should continue for several years, as Lord Kitchener predicts, the foreign supply—of Russian fiber at least—may be still further curtailed, and Italy has already put a limit to the amount of hemp that can be exported. However, Italian hemp is too costly for most uses by American manufacturers. In any event there is sure to be a demand for American-grown hemp at fair prices. But to secure "war prices" the quality of the fiber must be improved so as to more nearly resemble the grades of imported hemp with which it would compete.

American hemp is generally dew-retted, that is, the stalks, after harvesting, are spread evenly over the ground in order that the gums which hold the filaments of fiber together may be softened and dissolved by the action of the elements and by freezing and thawing in the early winter storms. This method of retting is practised to a very small extent in Europe where the usual custom is to ret in pits or pools of water, which insures a more even quality of fiber, and a lighter color. American water-retted hemp has been sold at 8 cents per pound when dew-retted was bringing half that figure. When American hemp was used in the United States navy, before the days of Manila and steel cable rigging, the fiber was required to be water-retted.

Hemp is a plant of easy growth, as it flourishes in a wild state in many parts of the world, and in portions of our own country, where it has escaped from cultivation. But simple growth, and growth for good fiber are two very different things, and a farmer going into the culture without knowledge, and a certain degree of skill, will be likely to have only his labor for his pains. Skill is particularly required in the after preparation, when the crop has been grown—that is to say, in the retting and cleaning of the fiber.

To insure the best results in the culture the work should begin the previous fall, when the land is plowed, to be followed by spring plowing and harrowing, for the the ground should be finely prepared. Limestone soils are particularly favorable; clayey loams, or alluvial soils such as are found in the river bottoms are best adapted to this plant, the larger part of the Breton hemp of France being produced along the smaller streams. Light, or dry soils, or heavy tenacious soils are most unfavorable. Kentucky growers, and some in other States, use no fertilizers, claiming that it is not necessary, as the plants do not exhaust the soil, a leading grower in giving his experience stating that he had produced crops for 15 years, successively, on the same land. While this may be true regarding many localities, doubtless the fiber produced could not have competed with even low-grade imported hemp. When New York was a hemp growing State, hardly two decades ago, the growers considered the use of fertilizers of first importance. The foreign

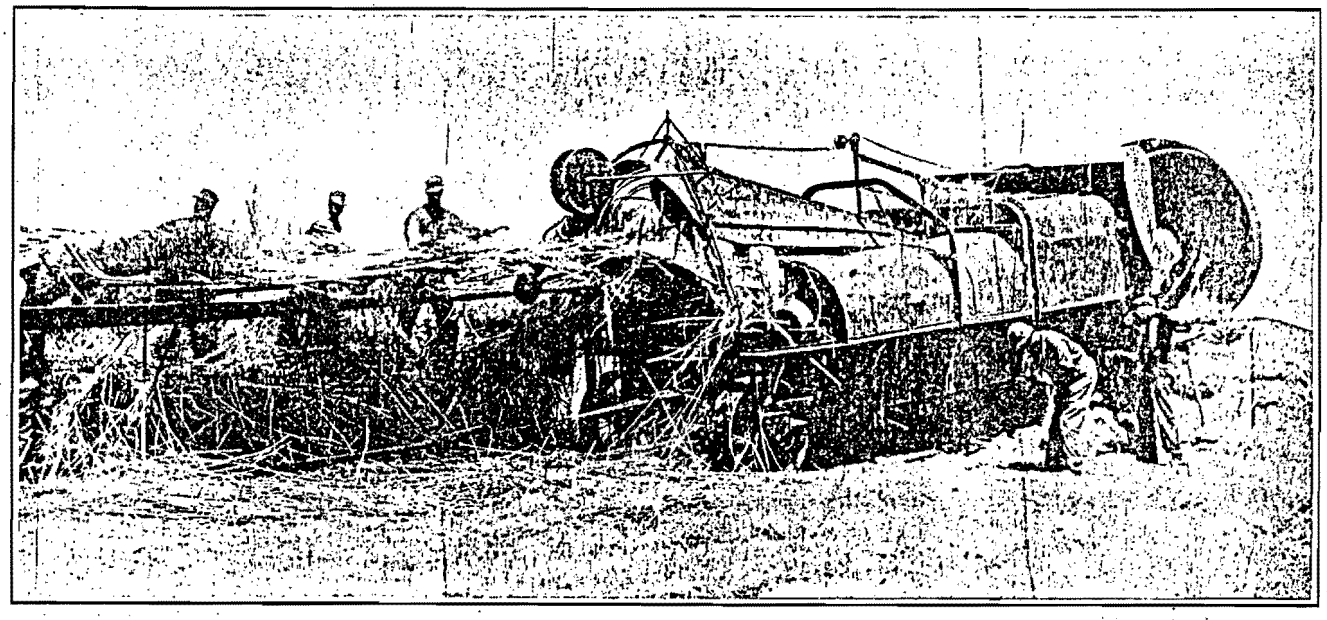


Fig. 3.—Breaking hemp by machinery. A hemp gin in operation.

practice has always been to use fertilizers liberally.

In France a rotation of crops is practised, hemp alternating with grain crops; although competent authorities state that it may be grown continually on the same land, but not without fertilizers. In Italy where the highest grades of hemp are produced, and rich, strong loams are chosen for the culture, the land is highly fertilized. Here is the pratice that was formerly followed in Bologna: First, manure and olive husks; second manures (sometimes hen manure); third, manure and the chrysalides of silk worms; fourth, manure and more olive husks—a "mixed diet," but very efficacious. The tough hemps of Japan and China are largely due to the heavy fertilizing given the soil with barnyard manures. The general practice in Kentucky is to burn the refuse, after cleaning the fiber, and spread the ashes over the land. In a few words, the highest results can only be attained by following in a measure the practice requisite for producing a crop of fine flax fiber, the chief essentials being a thoroughly well prepared seed-bed, and proper fertility of the soil. Weeds are the bane of the flax-grower; but the hemp-grower need not fear them as the hemp plant is a most thorough weed exterminator, and a crop of hemp is sometimes put in to clean a piece of land that has become over foul with the seeds of troublesome weeds.

Of equal importance with soil selection is seed selection, and a well filled seed should be chosen, of a light gray color, glossy and heavy. Mr. Dewey, of the Department of Agriculture, informs me that in a recent letter from Messrs. Glass and Glass of Camp Nelson, Kentucky, it is stated that they have some seed of the Minnesota No. 8 variety, which has been developed by selection at the Minnesota Experiment Station and the Department of Agriculture. Some of the plants of this variety in the seed-breeding plot of the Department, the past season, averaged 3.05 meters high. Regarding the proper quantity of seed to sow practice differs. In France 1½ bushels per acre is considered the proper amount; in Italy 2½ bushels; in New York as high as 3 bushels were sometimes put in, while in Illinois 1 to 2½ bushels are used. The general rule followed in Kentucky for many years has been to use 33 pounds per acre, sown broadcast and dragged in. The method of broadcast seeding employed generally in that State is to use the ordinary grain drill, after removing the rubber tubes, and attaching a board just under the hopper, to catch and scatter the seed as it falls, the drill hoes just behind doing the covering.

After the seed is in the ground there is nothing further to be done until the plants are grown, and the stalks have reached their maturity, which is determined by the finding of ripe seed in the heads—in Kentucky the average time is about 100 days. Harvesting was done formerly with a heavy, hooked implement something like a sickle, but more recently the work of cutting has been accomplished by machinery. The use of sweep-rake reapers has become common, although in some localities an ordinary mowing machine is employed, with a horizontal bar attachment placed about 4 feet above the cutting bar, to bend the stalks over in the direction that the machine is moving. It is said that with a 5½-foot mowing machine, thus equipped, one man and a team of two horses will harvest 6 to 8 acres a day. After cutting, the stalks may be allowed to remain on the ground as left by the machine, although if the crop is heavy they should be turned, as required, to assure uniformity in the curing. A better practice, but one which entails more labor, is to let the stalks lie until the leaves have fallen off when they are made into small sticks and allowed to remain in stack for a period of two months, after which they may be spread over the ground to be retted. The advantage is that winter-retted hemp is brighter than that done in October.

In these days of highly developed and efficient labor saving machinery, it is somewhat remarkable that the greater portion of the hemp fiber prepared in this country is cleaned on the clumsy wooden slat brake that has been used in Kentucky probably for a century (see Fig. 2). I found a similar form of brake in use in Brittany, though of lighter construction, being made of both metal and wood, and having seven instead of five slats. Breaking hemp in Kentucky, by hand, is an expensive operation, the work usually done by negroes, costing $1 to $1.25 per hundred pounds of fiber, and the best workers can clean no more than 150 pounds per day. Only half this quantity is done on a Sarthe farm in France, but the fiber is very much better prepared, and is worth twice as much money. A very primitive machine has been used in Italy, which first crushes the stalks, then cleans the fiber by beating; before the hemp is ready for market, however, it is still further cleaned, and all extraneous matters removed.

It is claimed that nearly 300 patents have been issued in the United States for machines for breaking hemp, the majority of which have proved absolute failures, while only a few have been found practical, most of these turning out inferior fiber. One of the most successful machine brakes, known as the Shely hemp gin (Fig. 3) has been in limited use in Kentucky and elsewhere during the past eight years. The device, mounted on wheels, weighs 7 tons, and is drawn by a farm traction engine which supplies the power when working. With a crew of fifteen men it will turn out 1,000 pounds per hour of clean, straight fiber, ready for baling, the broken fiber and tow being thrown out with the chive and waste matters. In this machine the stalks are fed sidewise and the delivery of the fiber is made in exactly the same manner.

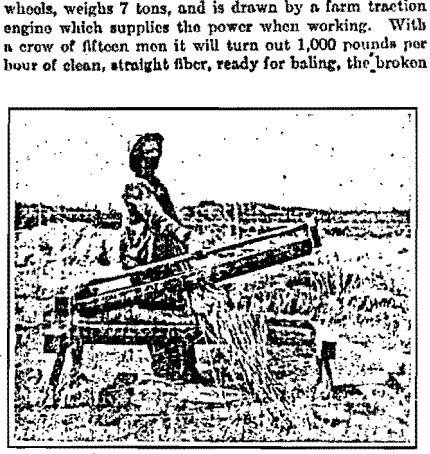


Fig. 2.—Breaking hemp by hand.

Regarding the cost of hemp production 20 years ago in Kentucky, the expense was estimated at $24 per acre with an average yield of 1,000 pounds of fiber. A crop of Japan hemp, grown in Kern county, California, cost, including baling and freight to market, $67 per acre with a return of 7,000 pounds of fiber. In an article on "Hemp" in the year book of the Department of Agriculture for 1913, Mr. Dewey gives the total cost per acre at $35 (on the basis of a 50-acre plot) with a return of 750 pounds of long fiber and 210 pounds of tow—yielding a profit of $20 per acre. The long fiber is figured at 6 cents and the tow at 4 cents per pound. In considering these figures it must be remembered that every cent added to the selling price of the fiber is just so much clear profit. That is to say, the expense account being already settled, an advance of 4 cents per pound—or 10-cent hemp—on the basis of 1,000 pounds of fiber per acre, would mean $40 additional profit. Surely, at the present high prices of hemp, the American culture ought to pay, without regard to tariff considerations.

The illustrations in this article are from negatives by Mr Dewey, Fiber Botanist at the Department of Agriculture.

Gunshot Wounds in War

Delivering a Hunterian oration before a meeting of the Royal College of Surgeons, recently, Sir Watson Cheyne described several interesting experiments which he had carried out regarding the disinfecting of gunshot wounds prior to their being more elaborately dealt with at a base hospital. By means of microscopic lantern slides the lecturer demonstrated the effects of various antiseptics on colonies of bacilli which had been placed on waxy substances, representing suppurating sores. With the exception of one case, where a composition of corrosive sublimate had entirely dispelled the bacilli—much to the surprise of the lecturer—carbolic acid and creosol had proved the most effective. The experiments, he said, had been carried out by a committee formed of Fleet Surgeon Basset Smith, Mr. Arthur Edmunds (attached to the Royal Naval College at Chatham), and himself, and they proposed to pursue these further in the endeavor to solve the problem of effectively dealing with gunshot wounds, which had mystified medical men for ages past.

The object in view was to introduce into such wounds at the earliest possible opportunity after infliction an antiseptic which would remain there, diffuse in the blood of the tissues, and inhibit the growth of the bacteria until such time as the wound could be thoroughly disinfected. He felt sure from the experiments carried out that the dangers attending the necessary delay in conveying wounded from the firing line to the base could be entirely removed, and was hopeful that complete disinfection of wounds could be effected. Such problems, however, could only be solved at the front.—*The London Daily Telegraph.*

but by practical experience. We try and try until we succeed in getting the effect that we want.

The accompanying photograph shows the original office force in front of the birthplace of The Sulu Press. This building has since given way to one much larger and better.

At the beginning of this article it was stated that this was the first exclusively Moro newspaper. This is true, but it may be of interest to know that for seven months, during the year 1911, there was issued in Zamboanga a

Page from "The Sulu News."

The first exclusively Moro or Sulu newspaper ever published. Printed from movable types.

small four-page paper partly in Moro and partly in English. It was a school publication under the Government.

This publication was known as *The Sulu News* (Ing Kabayta'bayta'an Sug). It was "A monthly newspaper in English and Sulu (Moro) published at Zamboanga, Moro Province, P. I., by the Government of the Moro Province, and printed by the Mindanao Herald Publishing Company. Editor: Charles R. Cameron, superintendent of schools, Moro Province. Associate editors: Sheik Mustafa Ahmad and Datu Rajamuda Mandi. Distributed free to all those desiring to receive it," was the description printed in the paper. This publication was discontinued when Mr. Cameron left for the States on furlough, and the type was entirely destroyed by fire on February 2, 1913. Thus it was impossible to resume publication.

In the issue of *The Sulu News*, dated December 31, 1911, Vol. I, No. 7. appeared the following notice:

"The editor regrets to announce that, owing to his departure for the United States on a six months' leave of absence, *The Sulu News* will suspend publication until his return. Our exchanges are therefore notified that we shall be unable to reciprocate during the greater part of 1912. Upon resuming publication we shall be happy to renew the exchange of periodicals."

Charles R. Cameron, now assistant to the department governor, has done a great deal for the new enterprise and at all times shows his interest.

The present newspaper is doing a lot to introduce English and American ideas among these primitive people for whom the United States is responsible, since they reside under the American flag. In every issue of the paper appears the English calendar beside the Mohammedan calendar which they have used for so many centuries.

All the Christian feasts as well as the Mohammedan feasts are recorded, and often comparisons made.

Their written language being phonetic, it is not difficult to teach them English names expressed in their characters. Of course it is quite another thing to teach them the meaning of English words, but this is coming gradually. The vocabulary spoken of above will be of equal value to the Moro, for he can learn English from it as well as the person speaking English can learn Moro.

It may be of interest to add that the heading of this unique newspaper when translated into English reads as follows: "*Surat Habar Sing Sug.* The news of the world in the Sulu language. Zamboanga, P. I., September, 1916, Zu'l-qu'dah 1334. Vol. II, No. 3."

WOOD-PULP PAPER IS FIFTY YEARS OLD.

It is a coincidence worth recording that March 5, the day on which the Federal Trade Commission announced that it would accept the proposal of the news-print manufacturers to fix a price of $2.50 a hundred pounds for wood-pulp paper in carload lots, was also the fiftieth anniversary of the making of the first wood-pulp for paper in this country.

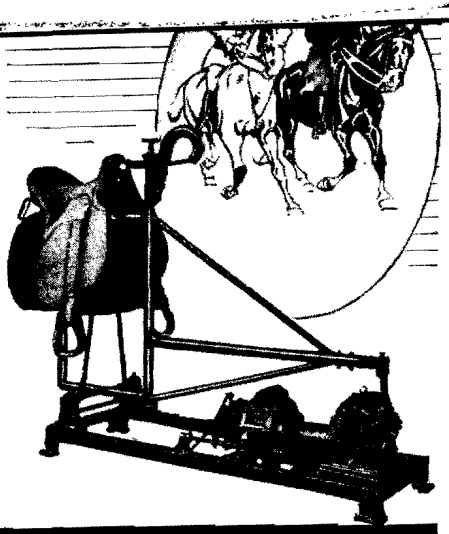
March 5, 1867, Alberto Pagenstecher produced the first wood-pulp in a mill which he had built up in the Berkshire hills in western Massachusetts. All that is left of that mill to-day is a pile of stone that is pointed out to the motorist on the road between Stockbridge and Lenox. The site of the mill was called Curtisville and is now Interlaken.

When Pagenstecher proved that paper-pulp could be made from wood his troubles only began, for he could not find a paper-mill to use it — they would not use "shoddy material," as they termed it. Such probity may exist among papermakers to-day, possibly. Wellington Smith, who owned a paper-mill on the same stream, pacified his conscience to at least try some of the "shoddy stuff" in his mill. He bought the pulp at eight cents a pound and turned it into paper which he sold at fourteen cents, and it proved to be good paper for newspaper purposes. It would take the printing-ink and absorb it beautifully.

When the news got out that a new fiber had been discovered with which to make paper, Wellington Smith could not supply the demand, so new mills sprang into existence. The Pagenstechers found their pulp-mill too small, so they moved over to New York, establishing mills at Luzerne and the large mill at Palmer Falls, in which Albrecht Pagenstecher still has an interest.

During these fifty years papermaking from wood-pulp has become one of the most important industries of the country. And another interesting fact about its manufacture is that it is said Gottfried Keller, in Würtemburg, Germany, about 1845, got the idea of wood-pulp paper from the nest of a paper-wasp. He interested a machinist named Heinrich Voelter in the matter, and planned the machinery which, with little improvement, is that still used.

FAME comes only when deserved, and then it is as inevitable as destiny, for it is destiny.— *Longfellow.*



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OUR HOME HASHEESH CROP

THE hemp plant, the source of the drug hasheesh, is one of the commonest weeds of the country; but there is little danger that it will seriously promote the drug habit. This is the opinion of government plant-scientists given in response to an inquiry from Science Service. Fear of its abuse has been exprest in various localities where the plant has been discovered growing. Hemp has been in this country for many years, having been introduced as a plant grown for fiber or oil and afterward having escaped and become thoroughly naturalized. Says the Service's *Daily Science News Bulletin* (Washington):

"There is no reason to become excited about a sporadic outbreak of hasheesh addiction," Dr. W. W. Stockberger of the Bureau of Plant Industry stated to Science Service. "Hemp has been cultivated as a fiber plant in Kentucky and other States for many years, and wild hemp is found in rich bottom-lands all the way from the Atlantic coast to the Western plains. While these hemp plants are not rich in the resins from which hasheesh is made, they do produce at times at least a little of them, which the drug firms buy up to make into veterinary medicine. Yet tho they have had ample opportunity, workers in the hemp fields have never become addicts.

"The hasheesh-producing varieties of hemp were introduced extensively into American culture a few years ago through the efforts of the Department of Agriculture," Dr. Stockberger continued; "for cannabis has a large and legitimate use in veterinary medicine. The cultivation of the drug hemp was carried on mainly in South Carolina. Large numbers of negro laborers were employed in the business, yet no cases of hasheesh addiction were reported.

"It made me smile a little when I saw the first reports that a young Mexican was 'concealing' his patch of hemp plants in a New York park. The plant grows from six to ten feet tall and requires plenty of open sunlight; concealment would not have been easy.

"Recent reports of the smuggling and use in this country of the Mexican hemp derivative 'marijuana' or 'marihuana' were no news to us," Dr. Stockberger stated. "We have had correspondence with El Paso and other border cities in Texas for a good many years about this situation. The reported effects of the drug on Mexicans, making them want to "clean up the town," do not jibe very well with the effects of cannabis, which so far as we have reports, simply causes temporary elation, followed by depression and heavy sleep. I suspect that the Mexican bravo does not take his marijuana straight, but mixes it with something else, possibly cocaine, or a couple of shots of mescal or bad whisky. That combination could easily bring on fighting madness."

E. P. Killip, of the U. S. National Herbarium, stated that all the various names of the hasheesh plant that are being bandied about should by rights be reduced to a single one. "Cannabis sativa"

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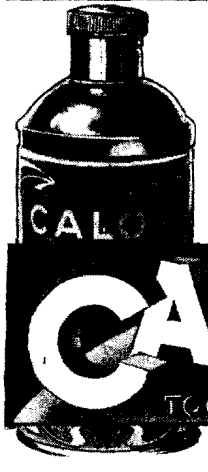

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is the accepted title now, according to Mr. Killip. "Indica" and "Americana" were once in use, he stated, but are now no longer accepted in botanical circles.

WHAT EUROPE THOUGHT OF AMERICAN PLANTS

SOME of the accounts of early botanical exploration in this country make interesting reading, as quoted in *The Missouri Botanical Garden Bulletin* (St. Louis). These occur in an article entitled "When American Plants First Went to Europe." We read:

English gardeners were listening two hundred years ago to plant explorers who had penetrated the American wilderness. One of these was Mark Catesby, who discovered, among other things, the catalpa, and introduced it into cultivation. "The Catalpa Tree," he says in his "Natural History of Carolina," "is usually a small tree, seldom rising above twenty feet in height. In May it produces spreading bunches of tubulous flowers like the common Foxglove. This tree was unknown to the inhabited parts of Carolina, till I brought the seeds from the remoter parts of the country. And tho the inhabitants are little curious in Gardenin, yet the uncommon beauty of the tree has induced them to propagate it; and 'tis become an ornament to many of their gardens."

Tho the earlier explorers did not come over specifically for plants, nearly all of them carried back roots and seeds to the mother country. Within half a century of the discovery of the New World material had accumulated to such an extent that by 1574 Dr. Nicholas Monardes, a Spanish physician, prepared a treatise on the medicinal uses of American plants. This was translated into English a few years later and published, with additions, under the title of "Joyfull Newes Out of the Newe Founde Worlde."

When the "First Plantation" was founded in Virginia in 1585, Thomas Hariot, a brilliant mathematician and astronomer, and a close personal friend of Sir Walter Raleigh, was sent over to report on the condition of the colony and the resources of the country. In his report he discust "Suche Commodities as Virginia is knowne to yeelde for victuall and sustence of mans life, usually fed upon by the naturall inhabitants as also by us during the time of our aboad." The following extracts are typical. "Pagatowr, a kinde of graine so called by the inhabitants; the same in the West Indies is called Mayze. English men call it Guinney wheate or Turkie wheate, according to the names of the countreys from whence the like hath been brought. The graine is about the bignesse of our ordinary English peaze and not much different in forme and shape; but of diuers colours; some white, some red, some yellow, and some blew. All of them yealde a very white and sweete flowre; being used according to his kinde it maketh a very good bread. Wee made of the same in the countrey some mault, whereof was brued as good ale as was to be desired. So likewise by the help of hops thereof may bee made as good Beere. It is a graine of marueillous great increase. . . . There is also another great hearbe in forme

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A Brief Account of Their Derivation, Their More Important Uses, Their Chief Physiological Effects, with Incidental Mention of Their Therapeutic Uses

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By Stanley Coulter, Ph.D., Sc.D.

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Prepared Especially for Students of Medicine

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CALCREOSE—Calcium Creosotate. A mixture containing in loose chemical combination approximately equal weights of creosote and lime.

Dose—From 0.25 to 1 Gm. (4 to 16 grains) every two to four hours, beginning with small doses and gradually increasing until tolerance is reached.

Physiological Action—See Creosote. It is claimed that calcreose does not readily produce gastric distress, nausea or vomiting.

CALOMEL—See Mercurous Chloride.

CALOMELOL—Colloidal Calomel. A colloidal form of calomel containing albuminoids.

Dose—Internally the same as calomel. Externally it is used as a dusting powder, mixed with an equal quantity of starch, or of a mixture of starch and zinc oxide, or in the form of calomel ointment.

Physiological Action—The action of calomelol is the same as that of calomel, but it is claimed that it is superior because of its power of forming colloidal suspensions in water, acting more rapidly and efficiently, and that it is non-irritant.

CALUMBA—The dried root of Jateorrhiza palmata (Lamarck) Miers (Fam. Menispermaceæ). Synonym: Columbo.

Dose—1 Gm. (15 grains).

Standard of Strength—Calumba yields not more than 2.5 percent of acid-insoluble ash.

Constituents—Calumba contains several alkaloids (calumbanin, jateorrhiza and palmatin) related to berberin.

Physiological Action—Calumba acts as a simple bitter, it is free from astringency, and is one of the most useful mild tonics with little stimulating power.

Note: Biberfield, 1909, found that these substances differ only quantitatively in action, paralyzing the central nervous system, especially the respiratory center, and lowering the blood pressure through cardiac and vaso-motor depression.

CALUMBA, TINCTURE OF

Dose—4 cc. (1 fluid dram).

CAMBOGIA—See Gamboge.

CAMPHOR

Dose—By mouth or hypodermic 0.2 Gm. (3 grains).

Constituents—A dextrorotatory ketone obtained from Cinnamomum Camphora (L.) Nees and Ebermaier (Fam. Lauraceæ).

Physiological Action—Camphor is a rapidly absorbed, volatile irritant. In many respects it acts like the volatile oils, and is classed with the antispasmodics. It is stimulant, sedative, rubefacient, diaphoretic, slightly antiseptic, etc.

Locally—It stimulates, and then paralyzes the sensory nerve endings, it also stimulates the nerve conveying the sense of cold.

General Action—It stimulates the central nervous system, first the brain then the medulla; this is succeeded by depression, and sometimes by paralysis of these centers.

Circulation and Respiration—Are first stimulated and then depressed. The medullary centers are affected and also the cardiac muscle. The cutaneous blood vessels are dilated causing diaphoresis.

Intestinal and Genito-Urinary Tracts—If poisoning is slow these may be irritated. Elimination takes place through the kidneys, lungs, and skin.

Poisoning—The following symptoms may be observed: rapid, feeble pulse; the blood pressure often shows curious rhythms of rise and fall; rapid shallow respiration; cold clammy skin; delirium, epileptiform convulsions; and others indicated above.

CAMPHOR, SPIRITS OF

Dose—1 cc. (15 minims).

Standard of Strength—Spirits of camphor contains not less than 9.5 Gm. and not more than 10.5 Gm. of camphor in each 100 cc.

CAMPHOR WATER

Dose—10 cc. (2.5 fluid drams).

Constituents—A saturated solution of camphor in distilled water, using 2 Gm. of powdered camphor in each 1,000 cc.

CANADA TURPENTINE OR BALSAM—A liquid oleoresin obtained from Abies balsamea (Linn.) Miller.

Dose—1.3 to 2 Gm. (20 to 30 grains).

Constituents—Volatile oil (20 to 30 percent) uncrystallizable resin, and a bitter principle.

Physiological Action—Resembles turpentine; rarely used in medicine.

CANNABIS—The female inflorescence of Cannabis sativa, Linn., var. indica.

Dose—0.06 to 0.6 (1 to 10 minims), increased cautiously. Physiologically tested.

Constituents—The latest investigations show two terpenes, paraffin, and cannabinol—a toxic red oil which has been found to exert the typical action of Cannabis indica. Cannabinol is readily oxidized after which it is inert. The chemistry of Cannabis indica is very difficult, and the list of constituents has been revised repeatedly.

Physiological Action—Powerful narcotic, antispasmodic, analgesic, anesthetic, in some instances aphrodisiac. Poisonous (?). It is very irritant to mucous surfaces and cannot be used as a local anesthetic.

The Nervous System—Cannabis indica produces a marked derangement of the central nervous system. The effect is a mixture of stimulation and depression—somewhat similar to morphine, and varies with individual and racial idiosyncracies. In full medicinal doses it causes exhilaration, intoxication, delirious hallucination, subsequently melancholia, drowsiness, stupor, and numbness of the extremities. In animals it produces ataxia and other evidences of action on the nervous centers. The sensation of pain is lessened or entirely absent. The pupils are dilated in poisoning.

The circulation is but little affected by ordinary doses, although in cases of poisoning in animals, the heart stopped before the respiratory movements ceased. Inhalation of the drug generally accelerates the heart. Intravenous injection slows the pulse in animals, partly through inhibitory

stimulation and partly through direct action on the cardiac muscles.

Alimentary and Urinary Tracts—The patient usually awakens from the influence of cannabis indica hungry. The intestinal secretions are not diminished as by opium, and there is no tendency to constipation; the urine is increased rather than decreased.

Poisoning—Although the drug produces alarming symptoms, there are no authentic records of fatal results in man. Patients recover from enormous doses. The symptoms may be combated by faradization of the respiratory muscles and careful doses of strychnine.

Note: This drug varies greatly in activity. None but a physiologically tested preparation should be used. Furthermore, it should be administered with caution, as the same dosage from the same lot may produce different degrees of effects upon different individuals, dependent on personal and racial idiosyncrasies.

CANNABIS, EXTRACT OF
Dose—0.015 Gm. (0.25 grain).
Physiological Action—See Cannabis.

CANNABIS, FLUID EXTRACT OF
Dose—0.1 cc. (1.5 minims).
Physiological Action—See Cannabis.

CANTHARIDES—The dried bodies of Cantharis vesicatoria De Greer. Synonyms: **Spanish flies. Russian flies.**
Dose—Diluted, 0.03 to 0.06 cc. (0.5 to 1 minim); rarely used internally.
Constituents—Cantharidin is the active one.
Physiological Action—An irritant poison—A powerful stimulant with a peculiar direction to the urinary and genital organs. It is diuretic in moderate doses. Externally applied it is rubefacient and vesicant.
Local Action—When applied to the skin it is very irritating producing redness, burning, vesication, severe pain, and if the contact be prolonged, deep inflammation and sloughing. Upon the mucous surface the effect is the same. Cantharidin is rapidly absorbed and eliminated unchanged by the kidneys; even when applied externally, it may be absorbed in sufficient amount to cause severe renal irritation.
General Action—Given internally, medicinal doses produce sensations of warmth in the mouth, throat and stomach, and slight stimulation of the kidneys and urinary tract. Its alleged aphrodisiac action is not manifest except when given in almost toxic doses.

Toxic Doses produce violent irritation, and even blistering of the mucous surfaces of the alimentary tract; great thirst; vomiting, probably of peripheral origin; intense pain in the abdomen, and purging. Death may result from collapse due to gastro-intestinal inflammation.

Genito-Urinary System—Pain is felt in the lumbar region, kidneys, bladder, and along the entire urethra. There is priapism, widespread acute nephritis, bloody urine—at first scanty, then suppressed, agonizing vesical tenesmus, great irritation of the external genito-urinary openings. One of the first changes in the kidneys is thought to be exudation of white blood corpuscles, then desquamative nephritis.

Circulatory System—The blood pressure and the cardiac force are lessened, the pulse rate is increased.
Respiration becomes rapid and dyspneic before death.

Central Nervous System—Fatal doses produce hyperemia of the brain and spinal cord. Confusion, passing into coma and convulsions, indicates a specific central nervous influence.

Antidotes—None known; treatment must be conducted on general principles; evacuation and washing of the stomach; demulcent and albuminous drinks freely; no oils. Opium by the rectum to allay pain and relieve the strangury. Anesthetics with caution in severe cases.

Note: Cantharides is the most important member of the group of related irritants which includes capsicum, poison oak, and croton oil.

CANTHARIDES, TINCTURE—Synonyms: **Cantharidis tinctura, P. I.**
Dose—0.1 cc. (1.5 minims).

CANTHARIDIN—$C_{10}H_{12}O_4$—The inner anhydride of cantharidic acid.

Dose—From 0.00025 to 0.0005 Gm. (1/240 to 1/120 grain).

Physiological Action—Preparations of cantharidin are used in place of corresponding preparations of cantharides and have the advantage of being more cleanly and more uniform in strength. Cantharidin is more toxic to the kidneys when the urine is acid than when it is alkaline.

CAPROKOL—**Hexyl-resorcinol.** A resorcinol in which one of the hydrogen atoms of the benzene ring is replaced by hexyl.

Dose—0.3 to 1 Gm. (5 to 15 grains).

Actions and Uses—A non-irritant urinary antiseptic effective in acid or alkaline urine. The efficiency of caprokol depends to some extent upon its property of reducing the surface tension of the urine. Diuretic drugs including sodium carbonate, and large quantities of fluids increase surface tension and should not be employed during treatment with caprokol. (See **Resorcinol.**)

CAPSICUM—The dried ripe fruit of Capsicum frutescens L., (Fam. Solanaceæ) grown in Africa. Synonyms: **Cayenne Pepper, African Chillies.**

Dose—0.06 Gm. (1 grain).

Standard of Strength—Contains not more than 3 percent of its stems and calyxes, and not more than 1 percent of other foreign organic matter; yields not less than .12 percent of non-volatile, ether-soluble extractive and not more than 1.25 percent of acid-insoluble ash.

Constituents—Capsaicin—A crystalline volatile acrid principle, oils and resins, etc.

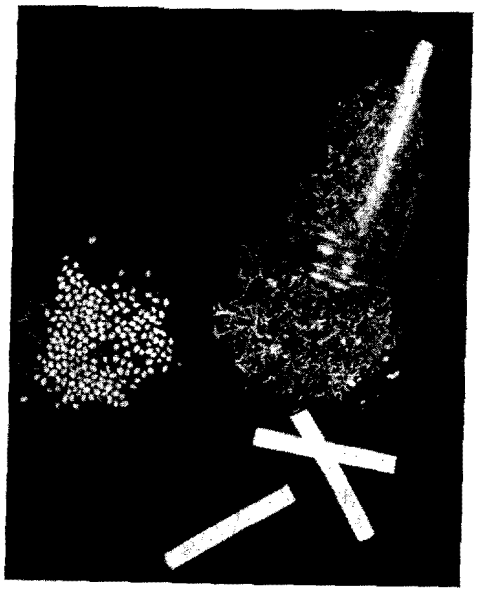
Physiological Action—A powerful topical stimulant and irritant, rubefacient and stomachic. Applied to the skin it soon produces redness, intense pain, and finally destroys the cuticle. It acts similarly on the mucous surface. Medicinal doses produce an agreeable sensation of warmth in the stomach; large or overdoses cause irritation of the ali-

Mariahuana

By Victor Lewitus

THERE is a plant which at present offers promise of adding its weight to our already overburdened narcotic problem. It is technically known as Cannabis indica, but is more commonly recognized as Indian hemp, hashish or mariahuana. It is also variously known, according to its manner of preparation, as bhang (the infusion), charas (the extracted resin), ganjah (as a tobacco), and majum (as a confection). The term mariahuana originates from the Mexican or South American languages in which the term connotes any substance which produces an intoxication, and the term hashish or hasheesh is partly represented in our own word "assassin." The terms thus point to some of its deleterious properties.

CANNABIS INDICA (MARIAHUANA)
Note the compound toothed leaflets and the clusters of flowers of this herbaceous plant



A JAR OF MARIAHUANA; THREE "REEFERS" OR MARIAHUANA CIGARETTES; HEMP SEED SOLD FOR BIRD FOOD

Although originally indigenous to India, Asia Minor, and Northern Africa, the drug has reached our shores where it grows in the wild state as Cannabis sativa. Recently it gained a place for itself in the newspaper columns because the New York police department discovered a lot in Brooklyn covered with the stuff. It was found on investigation that this "crop" was supplying the "needs" of a large number of soldiers on Governor's Island who came easily into the habit of purchasing the stuff in order that they might make "reefers" for themselves. The officers noticed that their troops went "loco" and could not report for duty, and this led the police to investigate, with the results referred to.

The plant consists of an herb which reaches several feet above a man's shoulders, bearing compound finger-like leaves which are conspicuously toothed, and flowers at the upper terminal ends in clusters. It contains an active resin which is optimum during the flowering stage—abundant in the female plant.

At one time it was cultivated in many parts of the world and in our own country for its fiber from which rope, twine, and cloth was made and for this purpose it is still utilized in some localities. It has also been employed for its oil (from the seeds) which is quick drying as is linseed oil. The seeds themselves are widely used in bird foods of various types. Furthermore, the resinous principle has marked analgesic properties and for this reason it is used as a part of the formula of corn collodions since it readily allays pain.

In the narcotic world, however, it is known as the "murderous" narcotic —a well-deserved caption for it is known that in the Orient bands of men under its influence have run amuck and perpetrated the most heinous crimes. The drug is used similarly to opium—often smoked, or chewed in the form of a sweetmeat. It produces hallucinations in which the mind is freed from all restraint. The imaginary experiences and sensations are intensely realistic and the victim of this narcosis finds delight in this, as if they were actual experiences. The reaction later reverses itself, and there is an imaginary suffering which finds expression in violent acts which often lead to a strong impulse to do great harm. It is during this stage that the desire to kill is greatest, and large groups of men have been known to engage in mortal combat under its influence. In large dosage, Cannabis may cause paralysis of the extremities, difficult breathing, and a feeling of impending death accompanied by that of uncontrollable terror.

Fortunately, unlike most other narcotics, the drug is not known to cause a permanent addiction, for by abstinence the victim can be cured. Continual use, however, is known to produce a violent type of insanity which has brought to it the name "loco weed." The subject will suddenly turn with murderous violence upon whomever is nearest to him. He will run amuck with knife, axe, gun, or anything else that is close at hand, and will kill or maim without any reason. After the sudden outburst wears away, the memory is left blank and the victim of these narcotic effects returns to normal.

The federal laws do not include hashish in their regulations but many of the progressive states have embodied in their statutes, measures to prevent its cultivation, sale, and distribution promiscuously. Even though it is not truly a "habit former" the danger of its widespread use, because of ease of cultivation, must not be overlooked. There have been some rumors as to its use by school children, which cannot be denied since it is easy to believe that these adolescents will "try anything once." Strict control such as that provided in the Harrison Narcotic Act is the remedy in this instance.

Leprosy in Hawaii

IN the April 10, 1936 issue of *Public Health Reports*, U. S. Treasury Department, Dr. C. W. Binford presents a history and study of leprosy in Hawaii, where the disease is still prevalent. While the spread of leprosy to the United States will probably never become serious, it nevertheless furnishes a focus of the disease commercially close to the mainland.

Oil, Paint and Drug Reporter

Founded 1871 by William O. Allison

Volume 131 JUNE 21, 1937

ctroplaters Elect A.B. Wilson President

ting Discusses Standards for Non-Ferrous Metal Type Of Plating

scussion of the progress of laboratests of plating on non-ferrous als in 1936, looking toward the depment of standard specifications, ther with the reading of technical ers on all phases of electroplating, the election of new officers conited the major interests of the nty-fifth annual meeting of the erican Electroplaters' Society, in ion in the Hotel Pennsylvania, this . June 14 to 17. There were 567 nbers in attendance.

The following officers were elected:—sident, A. B. Wilson, of the Chevro- Motor Company, Flint, Mich.; first e-president, Franklyn J. MacStocker, the Metal Art Company, this city; ond vice-president, Roy Goodsell, of Racine Plating Company, Racine, s.; third vice-president, Austin Fletr, of the Ternsted Manufacturing mpany, Binghamton, N. Y. W. J. R. nnedy, executive secretary, was reected.

Dr. William Blum, of the United ates Bureau of Standards, in reporting on the exposure tests of plated ating on copper, brass, zinc, and diesting, stated that these tests and a w new sets on steel and iron were arted in the spring of 1936. He stated at the report was confined to platng on non-ferrous metals on which ost of the coatings are thinner than ose on the steel, in accordance with ommercial practice. The effort is beg made to have the Federal specificaons consistent with the quality of ommercial articles that are required meet similar service, the report tated. In this connection it was furher stated that the requirement of the pecifications adopted by the American Electroplaters' Society and the Amercan Society for Testing Materials, especially for zinc and cadmium coatngs, have been incorporated in several Federal specifications.

The report, read by Dr. Blum, concluded that certain of the results were, however, so consistent that they warrant the following, purely tentative conclusions:—(1) Chromium coatings with no undercoat of nickel furnish very little protection; (2) Of all base metals, the protective value increases with the thickness of nickel; (3) Relatively thin nickel coatings furnish more protection on brass than on zinc or steel (this is consistent with the customary practice of using less nickel on brass than on zinc or steel); (4) About the same protective action is furnished by a given thickness on zinc and on steel.

In connection with the magnetic method for measuring the thickness of nickel coatings on non-ferrous metals,

Wage and Hours Bill Likely To Be Long Time in Process

WASHINGTON, June 17, 1937.

Arguments for and against the Black-Connery bill to control wages and working hours were continued this week by witnesses appearing before the joint hearings by the senate and house labor committees, although interrupted by the sudden death of Representative William P. Connery, jr., of Massachusetts, co-author of the bill and chairman of the house committee.

So far the committee has taken no action to fill the various blanks in the bill which will fix the minimum wages and maximum hours to be used in all industries producing goods for interstate commerce, nor has it attempted to resolve any of the other controversial sections of the bill.

A number of witnesses for business groups, including George H. Davis, president of the Chamber of Commerce of the United States, testified this week that the bill delegates excessive powers to the proposed labor standards board and might work great hardship on many types of industry.

Sidney Hillman, president of the Amalgamated Clothing Workers of America, endorsed the bill practically without reservations in spite of the fact that some other labor leaders have criticized the power of the board to fix wages higher than the flat minimum to be stipulated in the bill. Mr. Hillman did oppose giving the board power to investigate collective bargaining contracts with the purpose of ascertaining whether or not the hours and wages established by contract are in line with those set by the board for other industries.

The two committees evidently face a difficult task in revising the bill, and it is likely that much time will be consumed in the process, and that whatever legislation is enacted will be quite different from the present draft.

'Hot' Oil Extension Bill Is Signed by President

WASHINGTON, June 14, 1937.

The President today signed the Connally bill extending the so-called "Hot" Oil Law to June 30, 1939, as originally approved February 22, 1935, thereby insuring a continuation of the present oil conservation policy of the Department of the Interior.

Through the extension of the law there will be continued joint action in the conservation of oil and gas between the Federal Government and the States of Kansas, Louisiana, New Mexico, Oklahoma and Texas, which are now producing 75 percent of the total petroleum production of the United States. Each State determines for itself, in accordance with the provisions of State laws, the amount of oil which currently may be produced from its fields and wells in the prevention of above-ground waste and underground waste.

At the senate hearing on the bill, Secretary of the Interior Harold L. Ickes cited several examples of conservation through the co-operation of the Federal and State Governments. He said that the producing life of the East Texas field, which contains more than 22,000 wells and produces 15 percent of the national oil output, has been extended by the conservation of reservoir energy to such an extent that estimates of recovery from the field have been increased 30 percent or about 600,000,000 barrels.

Marihuana Regulation Bill Passed by House

WASHINGTON, June 14, 1937.

The house of representatives today passed a bill (H.R. 6906) for the regulation of the traffic in marihuana. The measure was passed in the amended form recommended by representatives of the oilseed crushing industry. It would require all handlers of marihuana (cannabis) to register with the Treasury Department and would place a tax of $1 an ounce on legitimate transfers of the drug and $100 an ounce on illicit dealings in the material.

The bill as passed omits from the definition of marihuana hempseed oil and oilcake and the sterilized seeds of the plant as well as the mature stalks. The definition was so written following hearings on the bill at which representatives of the hempseed industry suggested that such a definition would permit the industry to operate without interference while it would in no way defeat the purpose of the measure, the suppression of the illicit traffic in the marihuana drug.

Under the terms of the bill legitimate handlers of marihuana would be required to pay occupational taxes as follows: — Manufacturers, compounders, and importers, $24 per year; producers, $5 per year; dealers, $3 per year; practitioners, including doctors, dentists, and veterinarians, and those who use marihuana for experimental purposes, $1 per year.

The measure now goes to the senate.

Drug Ad Control by F.T.C.

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During di in the house to limit the However, Doughton of of the ways vanced the possibility of tax structur that if this June 30, 193 if they are only one yea

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Plate Gl By F.T

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MARIJUANA

Assassin of Youth

Marijuana, a stalk of which is shown above, is contributing to our alarming wave of sex crime, according to many police officials. The weed can be easily recognized by its seven-bladed, saw-tooth leaves. It grows in stalks from 3 to 8 feet high

THE sprawled body of a young girl lay crushed on the sidewalk the other day after a plunge from the fifth story of a Chicago apartment house. Everyone called it suicide, but actually it was murder. The killer was a narcotic known to America as marijuana, and to history as hashish. It is a narcotic used in the form of cigarettes, comparatively new to the United States and as dangerous as a coiled rattlesnake.

How many murders, suicides, robberies, criminal assaults, holdups, burglaries, and deeds of maniacal insanity it causes each year, especially among the young, can be only conjectured. The sweeping march of its addiction has been so insidious that, in numerous communities, it thrives almost unmolested, largely because of official ignorance of its effects.

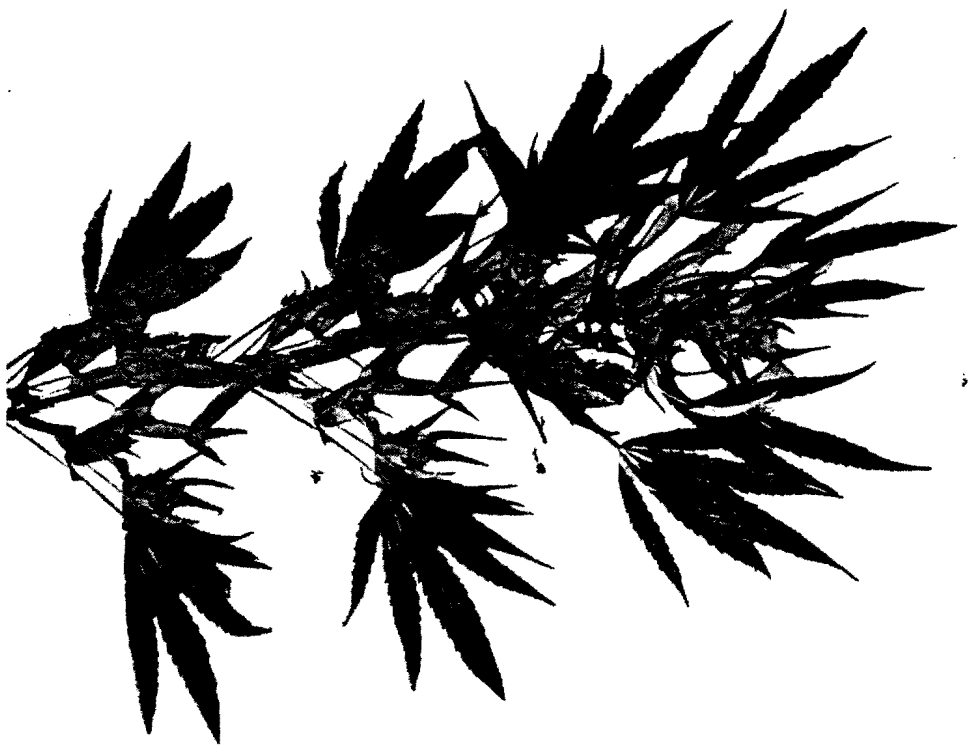
Here indeed is the unknown quantity among narcotics. No one can predict its effect. No one knows, when he places a marijuana cigarette to his lips, whether he will become a philosopher, a joyous reveler in a musical heaven, a mad insensate, a calm philosopher, or a murderer.

That youth has been selected by the peddlers of this poison as an especially fertile field makes it a problem of serious concern to every man and woman in America.

THERE was the young girl, for instance, who leaped to her death. Her story is typical. Some time before, this girl, like others of her age who attend our high schools, had heard the whispering of a secret which has gone the rounds of American youth. It promised a new thrill, the smoking of a type of cigarette which contained a "real kick." According to the whispers, this cigarette could accomplish wonderful reactions and with no harmful aftereffects. So the adventurous girl and a group of her friends gathered in an apartment, thrilled with the idea of doing "something different" in which there was "no harm." Then a friend produced a few cigarettes of the loosely rolled "homemade" type. They were passed from one to another of the young people, each taking a few puffs.

The results were weird. Some of the party went into paroxysms of laughter; every remark, no matter how silly, seemed excruciatingly funny. Others of mediocre musical ability became almost expert; the piano dinned constantly. Still others found themselves discussing weighty problems of youth with remarkable clarity. As one youngster expressed it, he "could see through stone walls." The girl danced without fatigue, and the night of unexplainable exhilaration seemed to stretch out as though it were a year long. Time, conscience, or consequences became too trivial for consideration.

Other parties followed, in which inhibitions vanished, conventional barriers departed, all at the command of this strange cigarette with its ropy, resinous odor. Finally there came a gathering at a time when the girl was behind in her studies and greatly worried. With every puff of the smoke the



A weed that grows wild throughout the country is making dope addicts of thousands of young people

BY H. J. ANSLINGER

U. S. Commissioner of Narcotics

WITH COURTNEY RYLEY COOPER

feeling of despondency lessened. Everything was going to be all right—at last. The girl was "floating" now, a term given to marijuana intoxication. Suddenly, in the midst of laughter and dancing, she thought of her school problems. Instantly they were solved. Without hesitancy she walked to a window and leaped to her death. Thus can marijuana "solve" one's difficulties.

The cigarettes may have been sold by a hot tamale vendor or by a street peddler, or in a dance hall or over a lunch counter, or even from sources much nearer to the customer. The police of a Midwestern city recently accused a school janitor of having conspired with four other men, not only to peddle cigarettes to children, but even to furnish apartments where smoking parties might be held.

A Chicago mother, watching her daughter die as an indirect result of marijuana addiction, told officers that at least fifty of the girl's young friends were slaves to the narcotic. This means fifty unpredictables. They may cease its use; that is not so difficult as with some narcotics. They may continue addiction until they deteriorate mentally and become insane. Or they may turn to violent forms of crime, to suicide or to murder. Marijuana gives few warnings of what it intends to do to the human brain.

THE menace of marijuana addiction is comparatively new to America. In 1931, the marijuana file of the United States Narcotic Bureau was less than two inches thick, while today the reports crowd many large cabinets. Marijuana is a weed of the Indian hemp family, known in Asia as *Cannabis Indica* and in America as *Cannabis Sativa*. Almost everyone who has spent much time in rural communities has seen it, for it is cultivated in practically every state. Growing plants by the thousands were destroyed by law-enforcement officers last year in Texas, New York, New Jersey, Mississippi, Michigan, Maryland, Louisiana, Illinois, and the attack on the weed is only beginning.

It was an unprovoked crime some years ago which brought the first realization that the age-old drug had gained a foothold in America. An entire family was murdered by a youthful addict in Florida. When officers arrived at the home they found (*Continued on page 150*)

MARIJUANA
Assassin of Youth

(Continued from page 19)

the youth staggering about in a human slaughterhouse. With an ax he had killed his father, his mother, two brothers, and a sister. He seemed to be in a daze.

"I've had a terrible dream," he said. "People tried to hack off my arms!"

"Who were they?" an officer asked.

"I don't know. Maybe one was my uncle. They slashed me with knives and I saw blood dripping from an ax."

He had no recollection of having committed the multiple crime. The officers knew him ordinarily as a sane, rather quiet young man; now he was pitifully crazed. They sought the reason. The boy said he had been in the habit of smoking something which youthful friends called "muggles," a childish name for marijuana.

Since that tragedy there has been a race between the spread of marijuana and its suppression. Unhappily, so far, marijuana has won by many lengths. The years 1935 and 1936 saw its most rapid growth in traffic. But at least we now know what we are facing. We know its history, its effects, and its potential victims. Perhaps with the spread of this knowledge the public may be aroused sufficiently to conquer the menace. Every parent owes it to his children to tell them of the terrible effects of marijuana to offset the enticing "private information" which these youths may have received. There must be constant enforcement and equally constant education against this enemy, which has a record of murder and terror running through the centuries.

THE weed was known to the ancient Greeks and it is mentioned in Homer's *Odyssey*. Homer wrote that it made men forget their homes and turned them into swine. Ancient Egyptians used it. In the year 1090, there was founded in Persia the religious and military order of the Assassins, whose history is one of cruelty, barbarity, and murder, and for good reason. The members were confirmed users of hashish, or marijuana, and it is from the Arabic "*hashshashin*" that we have the English word "assassin." Even the term "running amok" relates to the drug, for the expression has been used to describe natives of the Malay Peninsula who, under the influence of hashish, engage in violent and bloody deeds.

Marijuana was introduced into the United States from Mexico, and swept across America with incredible speed.

It began with the whispering of vendors in the Southwest that marijuana would perform miracles for those who smoked it, giving them a feeling of physical strength and mental power, stimulation of the imagination, the ability to be "the life of the party." The peddlers preached also of the weed's capabilities as a "love potion." Youth, always adventurous, began to look into these claims and found some of them true, not knowing that this was only half the story. They were not told that addicts may often develop a delirious rage during which they are temporarily and violently insane; that this insanity may take the form of a desire for self-destruction or a persecution complex to be satisfied only by the commission of some heinous crime.

IT WOULD be well for law-enforcement officers everywhere to search for marijuana behind cases of criminal and sex assault. During the last year a young male addict was hanged in Baltimore for criminal assault on a ten-year-old girl. His defense was that he was temporarily insane from smoking marijuana. In Alamosa, Colo., a degenerate brutally attacked a young girl while under the influence of the drug. In Chicago, two marijuana-smoking boys murdered a policeman.

In at least two dozen other comparatively recent cases of murder or degenerate sex attacks, many of them committed by youths, marijuana proved to be a contributing cause. Perhaps you remember the young desperado in Michigan who, a few months ago, caused a reign of terror by his career of burglaries and holdups, finally to be sent to prison for life after kidnapping a Michigan state policeman, killing him, then handcuffing him to the post of a rural mailbox. This young bandit was a marijuana fiend.

A sixteen-year-old boy was arrested in California for burglary. Under the influence of marijuana he had stolen a revolver and was on the way to stage a holdup when apprehended. Then there was the nineteen-year-old addict in Columbus, Ohio, who, when police responded to a disturbance complaint, opened fire upon an officer, wounding him three times, and was himself killed by the returning fire of the police. In Ohio a gang of seven young men, all less than twenty years old, had been caught after a series of 38 holdups. An officer asked them where they got their incentive.

"We only work when we're high on 'tea,'" one explained.

"On what?"

"On tea. Oh, there are lots of names for it. Some people call it 'mu' or 'muggles' or 'Mary Weaver' or 'moocah' or 'weed' or 'reefers'—there's a million names for it."

"All of which mean marijuana?"

"Sure. Us kids got on to it in high school three or four years ago; there must have been twenty-five or thirty of us who started smoking it. The stuff was cheaper then; you could buy a whole tobacco tin of it for fifty cents. Now these peddlers will charge you all they can get, depending on how shaky you are. Usually though, it's two cigarettes for a quarter."

This boy's casual story of procurement of the drug was typical of conditions in many cities in America. He told of buying the cigarettes in dance halls, from the owners of small hamburger joints, from peddlers who appeared near high schools at dismissal time. Then there were the "booth joints" or Bar-B-Q stands, where one might obtain a cigarette and a sandwich for a quarter, and there were the shabby apartments of women who provided not only the cigarettes but rooms in which girls and boys might smoke them.

"But after you get the habit," the boy added, "you don't bother much about finding a place to smoke. I've seen as many as three or four high-school kids jam into a telephone booth and take a few drags."

The officer questioned him about the gang's crimes: "Remember that filling-station attendant you robbed—how you threatened to beat his brains out?"

The youth thought hard. "I've got a sort of hazy recollection," he answered. "I'm not trying to say I wasn't there, you understand. The trouble is, with all my gang, we can't remember exactly what we've done or said. When you get to 'floating,' it's hard to keep track of things."

From the other youthful members of the gang the officer could get little information. They confessed the robberies as one would vaguely remember bad dreams.

"If I had killed somebody on one of those jobs, I'd never have known it," explained one youth. "Sometimes it was over before I realized that I'd even been out of my room."

THEREIN lies much of the cruelty of marijuana, especially in its attack upon youth. The young, immature brain is a thing of impulses, upon which the "unknown quantity" of the drug acts as an almost overpowering stimulant. There are numerous cases on record like that of an Atlanta boy who robbed his father's safe of thousands of dollars in jewelry and cash. Of high-school age, this boy apparently had been headed for an honest, successful career. Gradually, however, his father noticed a change in him. Spells of shakiness and nervousness would be succeeded by periods when the boy would assume a grandiose manner and engage in excessive, senseless laughter, extravagant conversation, and wildly impulsive actions. When these actions finally resulted in robbery the father went at his son's problem in earnest—and found the cause of it a marijuana peddler who catered to school children. The peddler was arrested.

It is this useless destruction of youth which is so heartbreaking to all of us who labor in the field of narcotic suppression. No one can predict what may happen after the smoking of the weed. I am reminded of a Los Angeles case in which a boy of seventeen killed a policeman. They had been great friends. Patrolling his beat, the officer often stopped to talk to the young fellow, to advise him. But one day the boy surged toward the patrolman with a gun in his hand; there was a blaze of yellowish flame, and the officer fell dead.

"Why did you kill him?" the youth was asked.

"I don't know," he sobbed. "He was good to me. I was high on reefers. Suddenly I decided to shoot him."

In a small Ohio town, a few months ago, a fifteen-year-old boy was found wandering the streets, mentally deranged by marijuana. Officers learned that he had obtained the dope at a garage.

"Are any other school kids getting cigarettes there?" he was asked.

"Sure. I know fifteen or twenty, maybe more. I'm only counting my friends."

The garage was raided. Three men were arrested and 18 pounds of marijuana seized.

"We'd been figuring on quitting the racket," one of the dopesters told the arresting officer. "These kids had us scared. After we'd gotten 'em on the weed, it looked like easy money for a while. Then they kept wanting more and more of it, and if we didn't have it for 'em, they'd get tough. Along toward the last, we were scared that one of 'em would get high and kill us all. There wasn't any fun in it."

Not long ago a fifteen-year-old girl ran away from her home in Muskegon, Mich., to be arrested later in company with five young men in a Detroit marijuana den. A man and his wife ran the place. How many children had smoked there will never be known. There were 60 cigarettes on hand, enough fodder for 60 murders.

A newspaper in St. Louis reported after an investigation this year that it had discovered marijuana "dens," all frequented by children of high-school age. The same sort of story came from Missouri, Ohio, Louisiana, Colorado—in fact, from coast to coast.

In Birmingham, Ala., a hot-tamale salesman had pushed his cart about town for five years, and for a large part of that time he had been peddling marijuana cigarettes to students of a downtown high school. His stock of the weed, he said, came from Texas and consisted, when he was captured, of enough marijuana to manufacture hundreds of cigarettes.

In New Orleans, of 437 persons of varying ages arrested for a wide range of crimes, 125 were addicts. Of 37 murderers, 17 used marijuana, and of 193 convicted thieves, 34 were "on the weed."

ONE of the first places in which marijuana found a ready welcome was in a closely congested section of New York. Among those who first introduced it there were musicians, who had brought the habit northward with the surge of "hot" music demanding players of exceptional ability, especially in improvisation. Along the Mexican border and in seaport cities it had been known for some time that the musician who desired to get the "hottest" effects from his playing often turned to marijuana for aid.

One reason was that marijuana has a strangely exhilarating effect upon the musical sensibilities (Indian hemp has long been used as a component of "singing seed" for canary birds). Another reason was that strange quality of marijuana which makes a rubber band out of time, stretching it to unbelievable lengths. The musician who uses "reefers" finds that the musical beat seemingly comes to him quite slowly, thus allowing him to interpolate any number of improvised notes with comparative ease. While under the influence of marijuana, he does not realize that he is tapping the keys with a furious speed impossible for one in a normal state of mind; marijuana has stretched out the time of the music until a dozen notes may be crowded into the space normally occupied by one. Or, to quote a young musician arrested by Kansas (*Continued on page 152*)

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WORTH LOOKING FOR

Our Changing WORLD

By JOHN DUNGAN

THE burglar, called the most poorly paid of all criminals, has had his wages cut again by an almost human mechanical detective. The moment he steps into a room it turns on lights, sets off a siren, signals the police, snaps his photograph, and even doses him with tear gas. The de luxe model, employed in factories, rings the manager's home and also the chief operator of the local telephone. The photoelectric cell is the brain of this robot watchman.

• •

DOCTORS can now see your bones, stomach, lungs, and other organs in action with the aid of a new X-ray movie camera. A fast-moving X-ray picture, when slowed down, permits the visual study of bodily functions, something previously impossible.

• •

TODAY'S youth studies a lot of things outside of classrooms and books. University of Miami zoology students dressed in diving helmets descend to the floor of the Gulf Stream to learn about life from the sea urchin. The University of Michigan course in scientific exploring has its lecture hall in the geological wilds of Alaska. At Southeastern Oklahoma State Teachers' a practical course in "minor household repairs" makes handy men of future husbands. And the student himself is his own text in the personality improvement class conducted by New York University.

• •

THE stewardesses of a coast-to-coast airline now make the men passengers feel at home by trading bedroom slippers and evening newspapers for their shoes.

• •

THE microscopic kitchenette in the modern apartment has encouraged a furniture manufacturer to devise a complete housekeeping unit that looks like a large radio, but when the lid is lifted an electric plate, percolator, and toaster pop up. Below there are drawers and compartments for dishes, utensils, and groceries, and on the back a small refrigerator.

• •

ARTIFICIAL products made from cow's milk now include buttons, combs, fountain-pen barrels, cigarette holders, glue, goldfish food, and artificial wool.

ENGINEERS are literally utilizing junk to build highways. In Georgia recently a stretch of road was built of old tin cans, flattened by a steam roller, then covered with packed sand and soil. Some Queensland, Australia, paving is rubber. Parisians are experimenting with iron roads. A mixture of molasses and oil is being used in treating certain highways in India. The Germans add powdered aluminum to prevent softening of tar and asphalt roads and to increase visibility at night.

• •

FAMILY washes are going into community washing machines in increasing numbers. The newest wrinkle is the metered and coin-operated electric washer, 600 of which are being installed in Detroit apartment buildings.

• •

FARMERS this summer can plow and reap to musical accompaniment. A new radio-equipped tractor also has water-inflated tires to make riding more comfortable. A tire manufacturer offers a special water-pressure tank, making inflation easy.

• •

A SPORTING goods factory recently grafted the bicycle onto the mechanical horse in a new one-piece gymnasium—a machine which does your exercising for you. Turn on the motor and the device delivers the simultaneous thrills of cantering, rowing, cycling, and swimming. It is designed for lazy people who need their livers shaken up.

• •

FOR housewives who drain palatable vitamins into the kitchen sink, the U. S. Bureau of Fisheries states that the oil in canned salmon just reeks with vitamins and the soft-cooked canned salmon bones are rich in calcium.

• •

S. FRIEDLANDER, of Memphis, Tenn., is inventor-of-the-month for creating a nonslip bathtub with a door in it. To operate: (1) Twist knob, letting down door, which becomes a rubber-covered ramp; (2) walk into the tub, sit down, slam door tight, and turn on the water; (3) proceed as in orthodox tubs, but be sure to drain before leaving if you value the plaster on the ceiling below.

(*Continued from page 151*) City officers as a "muggles smoker":

"Of course I use it—I've got to. I can't play any more without it, and I know a hundred other musicians who are in the same fix. You see, when I'm 'floating,' I *own* my saxophone. I mean I can do anything with it. The notes seem to dance out of it—no effort at all. I don't have to worry about reading the music—I'm music-crazy. Where do I get the stuff? In almost any low-class dance hall or night spot in the United States."

Soon a song was written about the drug. Perhaps you remember:

> Have you seen
> That funny reefer man?
> He says he swam to China;
> Any time he takes a notion,
> He can walk across the ocean."

It sounded funny. Dancing girls and boys pondered about "reefers" and learned through the whispers of other boys and girls that these cigarettes could make one accomplish the impossible. Sadly enough, they can—in the imagination. The boy who plans a holdup, the youth who seizes a gun and prepares for a murder, the girl who decides suddenly to elope with a boy she did not even know a few hours ago, does so with the confident belief that this is a thoroughly logical action without the slightest possibility of disastrous consequences. Command a person "high" on "mu" or "muggles" or "Mary Jane" to crawl on the floor and bark like a dog, and he will do it without a thought of the idiocy of the action. Everything, no matter how insane, becomes plausible. The underworld calls marijuana "that stuff that makes you able to jump off the tops of skyscrapers."

REPORTS from various sections of the country indicate that the control and sale of marijuana has not yet passed into the hands of the big gangster syndicates. The supply is so vast and grows in so many places that gangsters perhaps have found it difficult to dominate the source. A big, hardy weed, with serrated, swordlike leaves topped by bunchy small blooms supported upon a thick, stringy stalk, marijuana has been discovered in almost every state. New York police uprooted hundreds of plants growing in a vacant lot in Brooklyn. In New York State alone last year 200 tons of the growing weed were destroyed. Acres of it have been found in various communities. Patches have been revealed in back yards, behind signboards, in gardens. In many places in the West it grows wild. Wandering dopesters gather the tops from along the right of way of railroads.

An evidence of how large the traffic may be came to light last year near La Fitte, La. Neighbors of an Italian family had become amazed by wild stories told by the children of the family. They, it seemed, had suddenly become millionaires. They talked of owning inconceivable amounts of money, of automobiles they did not possess, of living in a palatial home. At last their absurd lies were reported to the police, who discovered that their parents were allowing them to smoke something that came from the tops of tall plants which their father grew on his farm. There was a raid, in which more than 500,000 marijuana plants were destroyed. This discovery led next day to another raid

on a farm at Bourg, La. Here a crop of some 2,000 plants was found to be growing between rows of vegetables. The eight persons arrested confessed that their main source of income from this crop was in sales to boys and girls of high-school age.

With possibilities for such tremendous crops, grown secretly, gangdom has been hampered in its efforts to corner the profits of what has now become an enormous business. It is to be hoped that the menace of marijuana can be wiped out before it falls into the vicious protectorate of powerful members of the underworld.

BUT to crush this traffic we must first squarely face the facts. Unfortunately, while every state except one has laws to cope with the traffic, the powerful right arm which could support these states has been all but impotent. I refer to the United States government. There has been no national law against the growing, sale, or possession of marijuana.

As this is written a bill to give the federal government control over marijuana has been introduced in Congress by Representative Robert L. Doughton of North Carolina, Chairman of the House Ways and Means Committee. It has the backing of Secretary of the Treasury Morgenthau, who has under his supervision the various agencies of the United States Treasury Department, including the Bureau of Narcotics, through which Uncle Sam fights the dope evil. It is a revenue bill, modeled after other narcotic laws which make use of the taxing power to bring about regulation and control.

The passage of such a law, however, should not be the signal for the public to lean back, fold its hands, and decide that all danger is over. America now faces a condition in which a new, although ancient, narcotic has come to live next door to us, a narcotic that does not have to be smuggled into the country. This means a job of unceasing watchfulness by every police department and by every public-spirited civic organization. It calls for campaigns of education in every school, so that children will not be deceived by the wiles of peddlers, but will know of the insanity, the disgrace, the horror which marijuana can bring to its victim. And, above all, every citizen should keep constantly before him the real picture of the "reefer man"—not some funny fellow who, should he take the notion, could walk across the ocean, but—

In Los Angeles, Calif., a youth was walking along a downtown street after inhaling a marijuana cigarette. For many addicts, merely a portion of a "reefer" is enough to induce intoxication. Suddenly, for no reason, he decided that someone had threatened to kill him and that his life at that very moment was in danger. Wildly he looked about him. The only person in sight was an aged bootblack. Drug-crazed nerve centers conjured the innocent old shoe-shiner into a destroying monster. Mad with fright, the addict hurried to his room and got a gun. He killed the old man, and then, later, babbled his grief over what had been wanton, uncontrolled murder.

"I thought someone was after me," he said. "That's the only reason I did it. I had never seen the old fellow before. Something just told me to kill him!"

That's marijuana!

MISS Champion

(*Continued from page 58*)

good thing I happened along when I did," Dan remarked, "with you playing peach-orchard shinny, and the tournament only a week away." He tossed up a ball and caught it. "This afternoon," he said, "you and I are going down to the Stop and Sock emporium on the Phillipsburg road and work on that slice of yours."

When they got back to the clubhouse Carena and Brick were on the porch.

Carena said, "Why, Danny, what in the world are you doing here?"

But Brick wasn't thrilled about it; Brick didn't clap him on the back and ask him to come in and have a drink, the way he usually did with celebrities. His dark

"Why don't you play around with us this afternoon, Danny?" Carena invited.

But Dan shook his head. "Sorry, Carena. I'm going to be busy."

And he was. He moved up to old Miss Pink's on the Waterloo road and turned up at eight every morning in his car. "Postman style holiday," he explained, and for a week there was somebody else's picture with "Chip Shots" in the *Evening Record*. Hour after hour they worked at the Stop and Sock place, getting her hands right, getting the quirks and twists out of the ball. They played the Newton course and Spring Brook, and Dodd's Hollow, where the tournament was to be played.

"There's a real mon," Gramp pronounced. Aunt Gretchen liked him, too. He stayed for dinner almost every night, and evenings they'd sit on the terrace and play Dodd's Hollow hole by hole. "Six's a mean one, Sherry," Dan would say. "Carena's sure to try to drive over the brook, but you play safe;" or, "Watch fourteen, Sherry. Those sand traps are a little nearer than they seem to be."

Gramp cleared a place for the Warren Cup on top of the bookcase. He could see it sitting there, he said, "all shiny and pawky." And Aunt Gretchen wondered what it would be like to have a champion in the family. But Sherry wasn't so sure. Sherry watched Carena and Brick walk

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FLAX *and* HEMP

From the Seed to the Loom

By GEORGE A. LOWRY

LOWRY & GRANT, INC., NEW YORK, N. Y.

THIS country imports practically all of its fibers except cotton. The Whitney gin, combined with improved spinning methods, enabled this country to produce cotton goods so far below the cost of linen that linen manufacture practically ceased in the United States. We cannot produce our fibers at less cost than can other farmers of the world. Aside from the higher cost of labor, we do not get as large production. For instance, Yugoslavia, which has the greatest fiber production per acre in Europe, recently had a yield of 883 lb. Comparable figures for other countries are Argentina, 749 lb; Egypt, 616 lb; and India, 393 lb; while the average yield in this country is 383 lb.

To meet world competition profitably, we must improve our methods all the way from the field to the loom. Flax is still pulled up by the roots, retted in a pond, dried in the sun, broken until the fibers separate from the wood, then spun, and finally bleached with lye from wood ashes, potash from burned seaweed, or lime. Improvements in tilling, planting, and harvesting mechanisms have materially helped the large farmers and, to a certain degree, the smaller ones, but the processes from the crop to the yarn are crude, wasteful, and injurious.

Some flax is now pulled by machine and retting hastened by using warm water in tanks. Spreading the straw to dry is still laborious work and, while a thousand patents have been issued for breakers and scrutchers, room for considerable improvement still remains. Spinning, while effective, is seven times more expensive for linen than for cotton, wool, or worsted, and the subsequent handlings are expensive and deleterious. As advances in the arts are not made by dwelling on their merits but rather on their demerits, I will now endeavor to show the present state of the art and where material improvement is possible.

While neither presuming nor attempting to instruct our agricultural experts, I wish to give our engineers who are not farmers an outline of fiber-flax production and the development of mechanisms for reducing the straw to fiber and making it into finished linen. If a strand of yarn from a piece of finished linen is unraveled, it will be found to be composed of fibers that are from $^{5}/_{8}$ to $1^{1}/_{2}$ in. long and approximately $^{1}/_{10,000}$ in. in diameter and look like cotton. Let us consider the mechanisms and processing used to reduce the fiber to this condition from its parent straw and compare these with more recent mechanisms and methods and compare the results attained by a new process at a fraction of the previous cost in time, labor, chemicals, and equipment. Real progress is always made from the complex to the simple.

CULTIVATION OF FLAX

Thorough knowledge of the soil and its vagaries can only be obtained by living on it through many successive rotations of crops and noting their effect on each other and the effect of different fertilizers. While the analysis of both plants and soils can be obtained, what particular chemical the microorganisms in the soil can best use to make the required plant food cannot be told. However, you can never be far wrong in using good old stable manure for it has a fine assortment of the necessary gases and bacteria. Belgium prefers cow manure for flax.

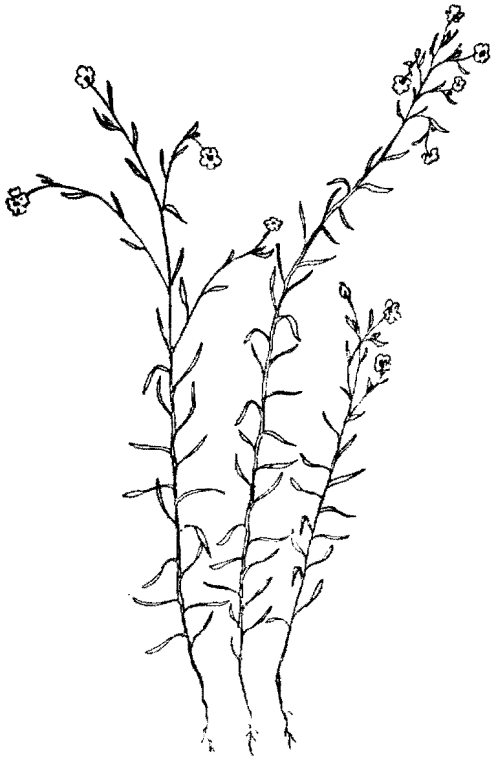

FIG. 1 FIBER FLAX

TABLE 1 AVERAGE YIELD PER ACRE FROM DIFFERENT SEEDS

Variety	Average scutched flax per acre, lb
Stormont Gossamer	731
Liral Crown	720
Stormont Cirrus	719
J. W. S.	613
Commercial (Riga)	467

Fiber flax (Fig. 1) has been grown almost everywhere between the frigid zones from upper Canada to South Africa and from the Atlantic to the Pacific but does best in temperate zones. An ample supply of moisture is the most essential requisite and early spring plantings are most likely to get it.

From the stubby taproot of fiber flax, many fine tendrils will go as deep in the ground as the plant is tall, provided the ground is sufficiently pulverized. Therefore, deep plowing and thorough breaking up of the soil is of the greatest importance in order that these tendrils may derive benefit from the moisture and gases from below, as well as taking other essentials down.

Much progress has been made in the last decade in developing new strains of fiber-flax seed to get better yields of straw, seed, and fiber. This was initiated by John W. Stewart, a North Ireland farmer, who, from many crops, selected the best specimens and kept planting the seed therefrom until he had what is now a standard seed, known to the trade as "J.W.S." From this, J. N. McBride of the Seaboard Air Line got a yield per acre of 6250 lb of dry straw, from which 1100 lb of fiber and $662^{1}/_{2}$ lb of seed were obtained, while the average yield from eight fields of ordinary flax was 3600 lb of straw and 476 lb of

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FIG. 2 STALK OF FIBER FLAX SHOWING LAY OF THE FIBERS

seed. Since Stewart started this plan, many imitations have appeared and some improvement has been made, the most important strains and their yields on test plots being given in Table 1.

The seed should be planted uniformly, 1 in. deep, at the rate of about 90 lb to the acre, after which the land should be well-harrowed and packed by rolling. It does not follow by any means that the large straw will give a better yield of fiber per pound but it does give more per acre.

HARVESTING

Fiber flax should be harvested before it is too ripe or between 75 and 100 days after seeding. At that time, the bolls begin to turn from yellow to brown, the seeds are firm and turning from drab to brown, the leaves have mostly fallen, and the stalks are turning yellow. A self-rake reaper, which will cut the flax close to the ground and place the straw in windrows, will probably give best results. The straw may be left a day to dry but should be kept straight. It is then bound in small bundles of not more than 6 in. in diameter and set up in shocks. A self-binder may serve the purpose but does not cut as low as a self-rake reaper, and the branching flax plants do not work as well in the elevator and binder as wheat and oats. Flax straw is tougher to cut than wheat or oats and the cutting bar should have a more rapid motion with sharp, smooth-edged cutting sections. Hand pulling costs $12 to $15 per acre; machine pulling, $8 to $10 per acre; and a self-rake reaper, $0.50 to $1 per acre.

The principle on which the machine pullers work is not new and several of them are on the market, but they are still much too expensive for anyone but large growers or community ownership. They consist of pairs of vertical belts traveling in the same direction and with sufficient pressure against each other to pull the straw out of the ground and carry it along to an automatic binder. Flax has been pulled instead of cut because it was necessary to keep the end of the straw sealed when pool or river retting was carried on since cut straw allowed water to enter the inside of the straw, causing it to ret unevenly. The new tall strains of flax and some little improvement in cutting bars of self-rake or self-binder are the most likely solution of the harvesting situation, as hand pulling in this country is hardly to be considered.

Average height of flax straw is 40 in. but many of the new strains exceed that length. Roots contain no fiber and the seed ends, but little. Average-size retted straw, not having more than 10 per cent of moisture, has from 28 to 30 per cent of fiber. This yield of straight fiber is never attained by the scutching mechanism now in general use; in fact, more often it is only half of that. As the flax grows, it has from 20 to 30 leaves at intervals along its stem, and, at each of these, is a node where the fibers coming up from the root run out. Considerable fiber, therefore, does not run the full length of the stalk. The lay of the fiber on the stalks is shown in Fig. 2.

If fiber is whipped from the root end to the seed end, many of these fibers may not be removed, but if the stalk is held by the seed end and whipped to the root end, against the grain as it were, these shorter fibers will be stripped off. This is what every method in general use for scutching flax, whether it be by hand, scutching wheel, turbine, or hackle, does. When the straw is broken, the scutcher grips a handful by the seed end and subjects it to a whipping action by a blade of wood in his hand or by a revolving wheel with several blades. He then reverses the beating from the root end toward the seed end. The whipped-off fibers go with the shives and this has to be rescutched and reworked many times to get rid of the latter. However, all of the losses do not occur in this way. Full-length fibers are made up of short, laminated ones that are held together by gums and enough of this gum is beaten off in these handlings to loosen somewhat their hold on each other. As a consequence, by the time the flax reaches the spinning stage, it is much under its original dimensions.

RETTING AND DRYING

Two methods of retting are practiced. The effect of water retting is to lessen the adherence of the fiber to the stem but leaving the former with its full strength to resist the severe whipping that is necessary to separate it from the shives. When chemical retting, which is really degumming, is used, the adherence of the fibers to each other is lessened to such an extent that they cannot withstand the strenuous beating of the scutching operation, and the result is a conglomerate mass of short fibers and shives.

In water retting, the straw is subjected to sufficient moisture—either from dew, melting snow, or rain or by submerging it in ponds, rivers, or tanks—to cause fermentation. This and the bacteria that develop partially consume the gums connecting the fiber with the woody portion of the stalk. If retting continues too long it will also consume the fibers, so care must be taken to remove the straw at a time when wood and fiber will part easily. In Russia, the largest producer, most of the flax is dew-retted which is not as good a method as water retting.

In Fig. 3 is shown the latter method being used in Belgium, where from ten days to two weeks are required; while in Ireland, where the climate is colder, it may take from two to four weeks, depending on the temperature of the water. To hasten this operation, tanks with water heated to about 90 F and circulating slowly are used and the practice is increasing. Retting of the stalks make the shives or woody part only fit for burning. If unretted, they contain 7 per cent of proteins and 3 per cent of fat and are almost as good as some clovers for cattle food or may be made a portion thereof.

After retting, the straw is spread on the grass and turned several times to keep the color even. When nearly dry, handfuls are set up on their root ends, cone fashion, so the air may blow through, and, in the event of rain, shed it off. Air drying for all fibers is preferred to artificial heat. When the straw is fully dried, it is tied in sheaves and stacked. After it has gone through a sweat, it is considered in good condition to go to the scutch mill. This last treatment is called stack curing.

MECHANICAL AND CHEMICAL DEGUMMING OF FLAX FIBER

Like many important advances in the arts, this also came about by accident. The inventors, while exhibiting a new machine for cleaning retted flax, ran out of retted straw but had a sheaf of the unretted straw just as it came from the field with the seed on. With misgivings, they ran it through the machine, and, to their astonishment, it was not only perfectly deseeded but almost perfectly scutched. With time and per-

sistence and many rebuildings of machines, scutching also was satisfactorily accomplished.

Then came the difficulty; no market existed for unretted fiber, and linen men ridiculed the idea of degumming chemically. In addition to this there was the knowledge that, in spite of large premiums offered during the Civil War for those who could make flax spinnable on cotton-mill machinery, which was made idle by the embargo on cotton, no one had succeeded in doing it. However, it was "root, hog, or die," and many experiments were tried with vegetable oils, ethyls, and alkalies at varying temperatures. Some were encouraging, but costs and results had to be kept in mind, and, out of all these, caustic soda was found cheapest and best and most easily recovered after using.

Treatment of flax can be varied considerably according to the character of the product desired and the uses to which it may be put. On one hand, we may wish to obtain a product for spinning on regular linen machinery, and, on the other, we may wish to make a fiber that will spin on cotton or woolen machinery, which will require a modified treatment. In the first case, crude fiber obtained by mechanical treatment of the straw and thus freed from over 80 per cent of the nonfibrous material originally contained may be subjected to hot water under pressure in the absence of air, at a temperature that is preferably above the normal boiling point. This treatment effectually removes water-soluble constituents and gives a fiber which is much like that obtained by careful retting but superior in strength and uniformity to ordinary retted fiber. It should be hackled just as ordinary retted fiber is hackled after scutching, as hot-water digestion does not remove the shives.

Instead of hot water under pressure being used alone, some sodium carbonate may be employed and this greatly increases the solvent action of the water and a fiber is obtained that is as strong as, but is also superior in color to, the best retted fiber. The sodium-carbonate solution does not digest the shives completely but leaves a fiber that can be spun on linen machinery after hackling.

To digest flax shives completely, a stronger more-protracted treatment is required. For this, an 8 or 10 per cent caustic-soda solution that has been heated to 300 F or above is used under pressure in the absence of air. Although much of the nonfibrous matter is destroyed within approximately 1 hr, thorough digestion requires a treatment of 2 hr or more. Treatment for 3 hr or longer does not sensibly injure the cellulose fiber that constitutes 35 per cent of the shives, and, as this treatment removes the wax at the same time that it digests the shives, a fiber is obtained which has the proper "slip" to spin well on either cotton or woolen machinery.

Table 2 presents a comparison of the losses in the various steps from scutched fiber to bleached linen using mechanical and chemical degumming. This shows that the weight of bleached fabric available from a dry-straw weight of 27,880 lb is 1305 lb with mechanical degumming and 2691 lb with chemical degumming or approximately 2¼ times as much. In addition, the labor and manipulation in the chemical method are only one tenth of those in the old method.

TABLE 2 COMPARISON OF MECHANICAL AND CHEMICAL DEGUMMING

	Mechanical		Chemical	
	Lb	Per cent	Lb	Per cent
Dry-straw weight	27,880	100.00	27,880	100.00
Scutched fiber	2,683	9.62[b]	6,970	25.00[b]
Degumming loss	564	21.12	4,182	60.00
Spinning fiber	2,119	78.88	2,788	40.00
Loss in spinning	254[a]	11.99	70[c]	2.51
Spun yarn	1,865	88.01	2,718	97.49
Bleaching loss	560	30.03	27	9.93
Bleached fabric	1,305	4.68[b]	2,691	9.65[b]

[a] Flax-mill machinery was used for spinning.
[b] Based on dry-straw weight; other percentages are based on the weight of material available after preceding process was completed.
[c] Cotton-mill machinery was used for spinning.

For making high-grade linen paper, most of the shives should be removed in the digestion, thus necessitating less bleaching than is ordinarily required in making paper pulp. Obviously, products having properties that are intermediate to those described may be adequate for certain purposes and they can, of course, be prepared with ease by slight modifications along the lines indicated.

SCUTCHING

In Russia, Poland, and the other Baltic states, much of the straw was, and some still is, placed on a V-shaped trough and then forced into it by a V-shaped lever that is hinged at one end of the trough. Repeated moving of the straw at right angles across the trough and repeated driving down of the lever breaks up the woody part of the stalk and loosens it somewhat from the fiber. This partially broken straw is then taken in handfuls and held over the back of a chair or the end of the table or in front of the scutcher himself and whipped downward with a blade that is preferably made of some hardwood, such

FIG. 3 RETTING STRAW IN BELGIUM

as beech or ash. It is continually spread out fanwise to get at the interior stalks and is then reversed so both ends can be scutched.

With the advent of power, the first machines were designed, at the suggestion of an agricultural expert, for use by farmers to thresh and scutch their own straw in weather when they could not work outdoors. In the early machines, fluted rollers for breaking the straw were developed as well as the wooden blade that is mounted at right angles to a revolving shaft and is used to whip off the cracked-up shives. Some machines, instead of having blades on the revolving shaft, have them on revolving drums and the flax is carried across the face of the drum by belts that clamp the fiber. Others are set up in intermeshing pairs with curved blades like lawn mowers and the flax is conveyed between them. To get away from whipping the straw against the grain and also to lessen the work of the scutchers, many experiments have been made with different forms of flute in the breaking rollers, as well as increasing their number and giving them irregular revolution.

Flax straw is sensitive to weather or moisture conditions, and, while that can be allowed for in all hand or wheel scutching, it is not satisfactorily taken care of in the drum or automatic types. The drum type is called the turbine and was developed because, as time went on, the difficulty of getting skilled scutchers increased since the work is hard and objectionable from a health standpoint. Turbines also have a larger output than hand scutching. In Belgium, where they are frequently used, the flax receives a preliminary scutching with the turbine and is finished on the handwheel. Scutchers and farmers have one great objection to the machine; it cannot scutch flax under 30 in. in length. Therefore, the farmers are docked heavily for the short straw which is used for upholstery tow instead of for valuable line flax. The distance on each side from the clamp to the scutching blades and the width of the holding clamps are the cause of the trouble.

Another type consists of four slotted plates that have a reciprocating motion between five stationary slotted plates. Each revolution of the driving shaft bends and rubs the straw eight times. When the machine is running at 1000 rpm, the straw thus receives 8000 rubbings and bendings per minute. As the average speed of the straw through the farmer's machine is 24 ipm, each inch of straw is rubbed and bent approximately 28 times with a driving-shaft speed of 1000 rpm. To suit varying straw conditions, the extent of the bending and the pressure of the rubbing can be quickly adjusted.

To get a crosswise rubbing in addition to the reciprocating movement, machines have been built with movable blades mounted on opposing crankshafts. Later developments in the demand for cellulose-yielding products for wood flour and possibly for fodder have resulted in the construction of a larger machine for heavy duty and also to scutch hemp. Since flax is harvested before cotton is planted and the gins are idle during the summer, growers could handle flax in their idle gin plants the same as they do seed cotton. Efforts are now being made to perfect this arrangement.

To remove the shives from flax and the shards from hemp, each individual blade must be acted on by the cleaning mechanism throughout its length. Consequently, the depth of the mass or apron of straw fed into the machine will materially affect its cleaning action; for the thicker the bed, the more difficult it is to reach the interior straws, and the thinner it is, the more certainly will all the straws be operated on. Therefore, the operator, in feeding the machine, must use both hands to give the straw a certain flattening out, and the machine itself must have a spreading-out action. When the fiber to be scutched is held in clamps, it is, to a certain extent, bunched. This is so even in hand scutching, but the results in either case are still so unsatisfactory that the fiber has to go through many combings, some of the pins being as close as 50 per inch before it is fit for spinning.

ROUGHING, HACKLING, AND SPINNING

On reaching the spinning mill, the first operation is called "roughing." Its purpose is to straighten out and parallel the entangled fibers and remove shives, also to square the ends by breaking off the straggling fibers, and to break up the hanks of scutched flax into "cuts" for convenience in hand hackling and to fit the clamps on the hackling machine. The work consists in repeatedly drawing the flax through a coarse hackle fastened to a bench until the required condition is attained. In this operation, the flax is first grasped by the top or seed end and hackled toward the root end and then reversed.

The flax is then put on the hackling machine, which consists of six pairs of opposing endless traveling ladders, 3 ft wide, having rungs or crossbars that are studded with long, sharp pins, graduated in closeness from 4 per foot to 50 per inch. It is clamped to a conveyor by the seed end so that combing will begin at the root end which is hanging down between the traveling ladders, and, as the flax passes through the pins, the conveyor gives it a wavelike motion. Root ends are combed first and then the operation progresses gradually toward the clamps. The pieces are then automatically reversed so that the other end of the flax may receive the same treatment. As the result of these two operations, the hanks of flax are reduced to half of their size when received because, in combing the flax from the seed end, all fibers which do not reach that far are torn off and go into tow, also called "noils." What remains is known as line flax and is ready for spinning. Results of careful tests of straw from the dry unretted to the spinning condition are given in Table 3, which shows that the total fiber yield is less than 10 per cent of the dry-unretted-straw weight, and more than half of this fiber yield is tow.

TABLE 3 FIBER YIELD OF WATER-RETTED FIBER-FLAX STRAW

	Fiber		Tow		Total	
	Lb	Per cent	Lb	Per cent	Lb	Per cent
Dry weight before retting	....	.....	...	....	27,880	100.00
Dry weight after retting	....	.....	...	....	15,060	54.13[b]
Weight loss in retting	....	.....	...	....	12,820	45.87[b]
Yield when wheel-scutched	2,071	13.75[a]	612	4.06[a]	2,683	17.81[a]
Yield after roughing in spinning mill	1,979	7.10[b]	704	2.53[b]	2,683[d]	9.63[b]
Yield after hackling in spinning mill	1,202	4.31[b]	1,411[c]	5.06[b]	2,613[d]	9.37[b]

[a] Based on dry weight after retting.
[b] Based on dry weight before retting.
[c] Carded weight of tow yarn is 917 lb or 3.29 per cent of dry weight before retting.
[d] Difference between total weights after roughing and after hackling, 70 lb, represents lint and dust that was removed in the latter operation.

By the time the fiber is ready for spinning, more than 90 per cent of the original dry-straw weight has been lost. In the spinning operation, approximately 1 per cent more or 12 per cent of the usable-fiber weight is lost. Many attempts have been made to utilize unretted flax straw and get a usable fiber without these extraordinary losses in volume and expense. The plan tried was to reduce the straw to tow by running it through many pairs of fluted rollers and then card and spin the fiber. A large amount of money was spent trying to make a

good binder twine from seed-flax straw in this way. It was a single-strand twine and when the dew and rain touched it, retting commenced, the gums softened, the fibers slipped on each other, and the sheaves fell apart. Insects liked the taste so well that half of the sheaves would be cut and come apart in a single night. Fabrics made from unretted fiber-flax straw soon become sleazy because, when the gums disappear, the size of the yarn is smaller. When mixed with other yarns, they lasted longer but, when subjected to moisture, the odor was objectionable. Consequently, the plan was abandoned in this country and abroad.

BLEACHING

After spinning the flax and making linen, the next step is bleaching which removes gums representing between 30 and 33 per cent of the usable-fiber weight. Bleaching is really a chemical degumming process and the material receives drastic treatment. The Irish method of bleaching consists of 22 steps and reduces the strength of the unbleached linen by slightly more than 36 per cent.

The procedure for bleaching 1500 kg of material by the Irish method follows:

(1) Boil for 14 hr with 125 kg of lime.
(2) Wash for 40 min. in stocks.
(3) Steep for from 2 to 6 hr in 2½ per cent (Twaddell) hydrochloric acid.
(4) Wash for 40 min in stocks.
(5) Boil for from 8 to 10 hr in 30 kg of caustic soda and 30 kg of rosin.
(6) Run off liquid and repeat boiling in caustic soda and rosin for 6 or 7 hr.
(7) Wash for 40 min in stocks.
(8) Grass for from 2 to 7 days.
(9) Steep for from 4 to 6 days in ½ per cent (Twaddell) solution of chloride of lime.
(10) Wash for 40 min in stocks.
(11) Steep for between 2 and 3 hr in 1 per cent (Twaddell) sulphuric acid.
(12) Wash for 40 min in stocks.
(13) Boil for between 4 and 5 hr in caustic soda.
(14) Wash for 40 min in stocks.
(15) Grass for 2 or 3 days.
(16) Steep for between 4 and 5 hr in ¼ per cent (Twaddell) solution of chloride of lime.
(17) Wash for 40 min in stocks.
(18) Grass for from 2 to 4 days.
(19) Steep for from 2 to 4 hr in ⅛ per cent (Twaddell) solution of chloride of lime.
(20) Wash for 40 min in stocks.
(21) Steep for between 2 and 3 hr in 1 per cent (Twaddell) sulphuric acid.
(22) Wash for 40 min in stocks.

If after going through the first 17 steps of the bleaching process the material is not sufficiently whitened, it is washed on the rubbing board with a strong solution of soft soap before completing the operation.

SEED FLAX

Seed flax is grown for the seed and is planted sparsely so it can branch out and have more seed-bearing ends. Since the straw has no market, long stubble is left in the ground. It is cut so high that the fiber left is not enough to justify the cost of scutching, and it has not been found profitable even for use in upholstery tow. The farmers call it their quick cash crop as it can be harvested in 90 days after planting and comes in far enough ahead of their other crops to take care of them financially. Quick threshing is, therefore, desirable and the machines used deseed 70 acres per day. Fiber from seed flax is good for cigarette and other linen papers. It is better than cotton linters for rayon and is also good for explosives.

The United States plants 2,500,000 acres of seed flax annually, Canada over 1,000,000, Argentina 5,000,000, and India 3,500,000. Practically all of this is burned except a small quantity that is fed to cattle in India and Russia. To prevent this great waste and give the farmers another source of income, a number have been interviewed and all declared their willingness to cultivate the soil so the binder could cut closer to the ground and to plant more heavily so the plants would grow taller and less branchy. It was pointed out to them that, while the average yield in the United States is only 6 bu per acre, fiber flax, which is planted 90 lb per acre, yields 10 to 15 bu per acre, thus giving not only enough additional seed to make the crop profitable but also straw that is profitable. The farmers said they would gladly try this plan if they could sell the crop as it stood and get cash. The farmer would harvest the crop for the buyer, who would take it when he wanted it. This sounds like a reasonable proposition for both farmer and purchaser.

It is imperative that the blades of straw be parallel to each other if they are to be cleanly scutched and a machine has been devised that will parallel the tangled, threshed straw. If the farmers will not accept the plan suggested—to plant closer, cut the stalks close to the ground, and then let the buyer thresh and scutch in one operation, as can be done now—then the straw can be put through the paralleler and scutched in the ordinary way.

HEMP PRODUCES LARGE CROPS WITH LITTLE ATTENTION

Hemp, the strongest of the vegetable fibers, gives the greatest production per acre and requires the least attention. It not only requires no weeding but also kills off all the weeds and leaves the soil in splendid condition for the following crop. This, irrespective of its own monetary value, makes it a desirable crop to grow. In climate and cultivation, its requisites are similar to flax and, like flax, should be harvested before it is too ripe. The best time is when the lower leaves on the stalk wither and the flowers shed their pollen. A view of hemp being harvested in Canada is presented in Fig. 4.

Like flax, the fibers run out where leaf stems are on the stalks and are made up of laminated fibers that are held together by pectose gums. When chemically treated like flax, hemp yields a beautiful fiber so closely resembling flax that a high-power microscope is needed to tell the difference and only then, because in hemp, some of the ends are split. Wetting a few strands of each fiber and holding them suspended will definitely identify the two because, upon drying, flax will be found to turn to the right or clockwise and hemp to the left or counterclockwise.

Before the war, Russia produced 400,000 tons of hemp, all of which is still hand-broken and hand-scutched. They now produce half that quantity and use most of it themselves, as also does Italy from whom we formerly had large importations. In this country, hemp, when planted 1 bu per acre, yields about 3 tons of dry straw per acre. From 15 to 20 per cent of this is fiber and 80 to 85 per cent is woody material. The rapidly growing market for cellulose and wood flour for plastics gives good reason to believe that this hitherto wasted material may prove sufficiently profitable to pay for the crop, leaving the cost of the fiber sufficiently low to compete with 500,000 tons of hard fiber now imported annually. Hemp being from two to three times as strong as any of the hard fibers, much less

weight is required to give the same yardage. For instance, sisal binder twine of 40 lb tensile strength runs 450 ft to the lb. A better twine made of hemp would run 1280 ft to the lb. Hemp is not subject to as many kinds of deterioration as are the tropical fibers and none of them lasts as long in either fresh or salt water.

While the theory, in the past, has been that straw should be cut when the pollen starts to fly, some of the best fiber handled by Minnesota hemp people was heavy with seed. This point should be proved as soon as possible by planting a few acres and then harvesting the first quarter when the pollen is flying, the second and third a week or ten days apart, and the last when the seed is fully matured. These four lots should be kept separate and scutched and processed separately to detect any difference in the quality and quantity of the fiber and seed.

Several types of machine are available in this country for harvesting hemp. One of these was brought out several years ago by the International Harvester Company. Recently, growers of hemp in the Middle West have rebuilt regular grain binders for this work. This rebuilding is not particularly expensive and the machines are reported to give satisfactory service.

Degumming of hemp is analogous to the treatment given flax. The shards probably offer slightly more resistance to digestion. On the other hand, they break down readily upon the completion of the digestion process. An excellent fiber can, therefore, be obtained from hemp also. Hemp, when treated by a known chemical process, can be spun on cotton, wool, and worsted machinery and has as much absorbence and wearing quality as linen.

SCUTCHING MACHINERY

Several types of machine for scutching the hemp stalks are also on the market. Scutch mills formerly operating in Illinois and Wisconsin used the system that consisted of a set of eight pairs of fluted rollers, through which the dried straw was passed to break up the woody portion. From there, the fiber with adhering shards or hurds, as they are called, was transferred by an operator to an endless-chain conveyor. This carries the fiber past two revolving single drums in tandem or between two opposing pairs of drums in tandem, all having beating blades on their periphery, which beat off most of the hurds as well as the fibers that do not run the full length of the stalks. The proportion of line fiber to tow is 50 per cent each. Tow or short tangled fiber then goes to a vibrating cleaner that shakes out some of the hurds.

In Minnesota and Illinois, another type has been tried out. This machine consists of a feeding table upon which the stalks are placed horizontally. Conveyor chains carry the stalks along until they are grasped by a clamping chain that grips them and carries them through half of the machine. A pair of intermeshing lawn-mower type beaters are placed at a 45-deg angle to the feeding chain and break the hemp stalks over the sharp edge of a steel plate, the object being to break the woody portion of the straw and whip the hurds from the fiber. On the other side and slightly beyond the first set of lawn-mower beaters is another set, which is placed 90 deg from the first pair and breaks the other end of the straw over a similar sharp-edged steel plate and whips out the hurds. The first clamping chain transfers the stalks to another to scutch the fiber that was under the clamp at the beginning. Unfortunately, this type of scutcher makes even more tow than the so-called Wisconsin type. This tow is difficult to reclean because the hurds are broken into long slivers that tenaciously adhere to the fiber.

Another type passes the stalks through a series of graduated fluted rollers. This breaks up the woody portion into hurds about $^3/_8$ in. long and the fiber then passes on through a series of reciprocating slotted plates working between stationary slotted plates. Adhering hurds are removed from the fiber which continues on a conveyor to the baling press. Because no beating of the fiber against the grain occurs, this type of scutcher makes only line fiber. This is then processed by the same methods as were described for flax.

Paint and lacquer manufacturers are interested in hempseed oil which is a good drying agent. When markets have been developed for the products now being wasted, seed and hurds, hemp will prove, both for the farmer and the public, the most profitable and desirable crop that can be grown and one that can make American mills independent of importations.

Recent floods and dust storms have given warnings against the destruction of timber. Possibly, the hitherto waste products of flax and hemp may yet meet a good part of that need, especially in the plastic field which is growing by leaps and bounds.

FIG. 4 HARVESTING HEMP IN CANADA

possible. In any case, the move is a signal of declining volume—as well as declining profit margins—to still another group of distributors. Hard-goods dealers are already on the spot, and filling stations soon will be if gasoline rationing is nationalized.

Meanwhile, Washington is giving a new earnest of its intentions to moderate wage increases, talking about administrative machinery to deal with the 90% of all wage negotiations that are outside the National War Labor Board's purview. But profits are bound to be pinched, nonetheless. Many raises must still be granted, and, as labor shortages intensify in coming months, boosts in numerous lowpaid lines will be irresistible.

Hints of freight rationing to come are in the wind this week. WPB has created a new committee to recommend preferential treatment for various types of traffic, when transportation facilities prove inadequate. And the Office of Defense Transportation has announced institution of a nationwide check on carload freight billed at each station. The data will be of help, among other things, "in certifying priorities, if necessary."

"Tentative" Taxes

House committee levies encounter opposition but still meet only half the bill. Sales tax threatens increasingly.

As matters stand, few in authority appear satisfied with the tax bill in its present tentative draft—and "tentative" should be emphasized. In efforts to raise $8,700,000,000 of revenue, the Ways and Means Committee has run into multiple difficulties, and in some of the "tentative" decisions reached it has encountered stiff constituent complaint.

Hence the common prediction, shared by members of the committee, that when the overall tax picture has been studied thoroughly, drastic revision will come.

• **Halfway**—Thus far, the new provisions "tentatively" approved by the committee would achieve not much more than half the Administration's revenue goal through the following devices:

From corporations, through a 94% excess-profits tax and with increases in both the normal and surtax rates—$2,400,000,000.

From individuals, through lowering exemptions for married persons to $1,200, single persons to $500, and by increasing the normal rate from 4% to 6% and surtaxes from 6% to 77% to a schedule of 12% to 81%—$2,750,000,000.

From mandatory joint tax returns by married persons, $300,000,000.

From revision of the capital gains tax (page 68), $50,000,000.

In addition, there is the estate and gift tax which is expected to yield about $300,000,000 when approved.

• **"Head" Tax Idea**—Concerned at the turn things are taking, Secretary Morgenthau proposed the "head" tax on individual income tax-filers of $5; talked of enforcing collection by a withholding tax of as much as 10%; and intimated that, while his own proposal for lowering individual exemptions had been granted "tentatively" by the committee, he remained still opposed to any sales tax, as do most New Dealers.

The committee, theoretically, still has to find ways of raising about $3,000,000,000 more. Through plugging the loopholes and making a few technical changes in the law affecting mutual insurance companies, a few hundred millions might be raised. But this would be the "hard way," a way spurned by politicians, and it still would leave unsolved the answer as to where the rest could be found.

• **Face to Face with Sales Tax**—The committee thoroughly realizes that the next hard hurdle will be to decide either on a sales tax of steep rates or on even steeper rates on a broad schedule of excise taxes that include most items of domestic consumption. Few committeemen believe that the sum can be raised in the latter manner. But many of them are reluctant to recommend a sales tax, although they say privately this is about the only thing the federal government can do to get what it needs. It is a step which would be taken at the expense of many states that have objected strenuously to an "invasion" of their tax field.

As for the political aspects of the dilemma, members of the committee already have been catching the devil because of the lowering of income tax exemptions. As a consequence, they may change their mind. Labor, all factions, has opposed dipping into the incomes of the "small" income group, and sees in the sales tax an even more onerous load. The labor leaders know that a sales levy cannot be evaded, whereas many of the hundreds of thousands of so-called "migrant" war workers would not file an income tax return because the government would never be able to catch up with them, even though their incomes were dutifully reported by their employers.

Members don't like the unduly large quantities of mail they are getting, chiefly from those who are already paying an income tax and would be hardest hit by the lowering of exemptions.

• **For the $5,000–$25,000 Man**—Although the committee at mid-week had reached no decision on the withholding tax, it is being importuned to enact one so that the taxpayer—particularly the man in the $5,000 to $25,000 group—will have a credit next March 15 against the increased tax he knows he will have to shoulder.

GUARDED HEMP SEED

For the last few months, the nation's entire supply of hemp seed has been guarded in a Kentucky warehouse almost as closely as the nation's gold reserves at nearby Ft. Knox. One reason for the armed guards is that hemp seed is the source of a narcotic; more important, it will produce in 1942 enough seed for 350,000 acres next year, thus relieving the shortage of hemp formerly imported from the Philippine Islands.

Placing Cured Stalks in Shocks

"The Tented Fields"

HARVESTING HEMP

Cutting and Shocking Seed Hemp

It's time to reconsider hemp

Let me say up front that I have never smoked a commercially made cigarette, much less that devil weed with roots in hell. Passed through the '60s without a single pair of tie-dyed bell-bottoms. Identified more with Merle Haggard's "Okie from Muscogee" than Jim Morrison's "Light My Fire."

Yet, I believe that Indian hemp (*Cannabis sativa*—yes, that Cannabis) has more to offer the paper industry than we are taking advantage of (or more correctly, we are allowed to take advantage of).

Tradition, if not federal law, is on the side of hemp, starting with Ts'ai Lun himself. According to the book, *The Emperor Wears No Clothes*, by Jack Herer, from 75% to 90% of the world's paper manufactured before 1883 was made from Cannabis hemp fiber, including the Gutenberg *Bible* and the first two drafts of the Declaration of Independence. Augmenting the tradition of hemp fiber, the USDA in 1916 predicted a papermaking future for nonfiberous portions of the hemp stalk in its Bulletin No. 404, *Hemp Hurds as Paper-Making Material*. Hemp hurds are 0.5-in. to 3-in. pieces of the woody inner portion of hemp that have been separated from the fiber. Hurds contain more than 77% cellulose.

Reporting on papermaking tests with hemp hurds, the bulletin concluded, "Hemp-hurd stock acts similarly to soda-poplar stock, but will produce a somewhat harsher and stronger sheet and one of higher folding endurance. . . . In fact, the hurd stock might very possibly meet with favor as a book-stock furnish in the Michigan and Wisconsin paper mills, which are within the sulphite fiber-producing region."

A long-awaited mechanized breakthrough in removing the fiber-bearing cortex from the rest of the hemp stalk "without a prohibitive use of human labor" was described in a three-page article in the February 1938 issue of *Popular Mechanics* entitled, "The New Billion-Dollar Crop." Written at the time of the passage of the federal Marijuana Tax Act of 1937, the article included the challenge, "If federal regulations can be drawn to protect the public without preventing the legitimate culture of hemp, this new crop can add immeasurably to American agriculture and industry." This was not to be, however. Perhaps not coincidentally, the Tax Act uprooted the billion-dollar crop (1938 dollars) before it could be planted.

It is the dried flowers and top leaves of the female *Cannabis sativa*, of course, that constitute marijuana. Without opening the debate on its legalization or the psychotropic effects of its delta-9 tetrahydrocannibal (THC) content, it is worth noting that interest in papermaking from hemp continues as our fiber, energy, and environmental concerns increase.

The '70s was a decade of intensive study of Cannabis papermaking, particularly in Italy, France, Spain, and Holland. Different varieties of hemp have been developed for various papermaking applications, depending on the cooking process and end use of the pulp. Concurrent research and selective breeding reduced THC content. In France, farmers must obtain low-THC Cannibis seed directly from the National Hemp Producers Federation, inform the Ministries of Health and Agriculture of their intent, and have a guaranteed purchaser of their crop.

The high cost of limited production currently restricts hemp to specialty use such as European and Asian cigarette papers. Cannibis hemp can probably be pulped in existing kenaf-pulping equipment, but it will take more than imported stock to make it economically feasible.

Hemp is the world's primary biomass producer, growing ten tons/acre in approximately four months. It can produce four times the amount of paper/acre than 20-year-old trees can and will grow in all climatic zones of the contiguous 48 states.

Pyrolysis of hemp can be adjusted to produce charcoal, pyrolytic oil, gas, or methanol with a claimed 95.5% fuel-to-feed efficiency. Pyrolytic fuel oil has properties similar to Nos. 2 and 6 fuel oil. Burning charcoal does not cause acid rain.

U.S. hemp-growing restrictions were set aside to meet material shortages during World War II. They should now at least be modified to meet pending shortages of fiber, energy, and environmental quality.

JIM YOUNG
is technical editor of Pulp & Paper

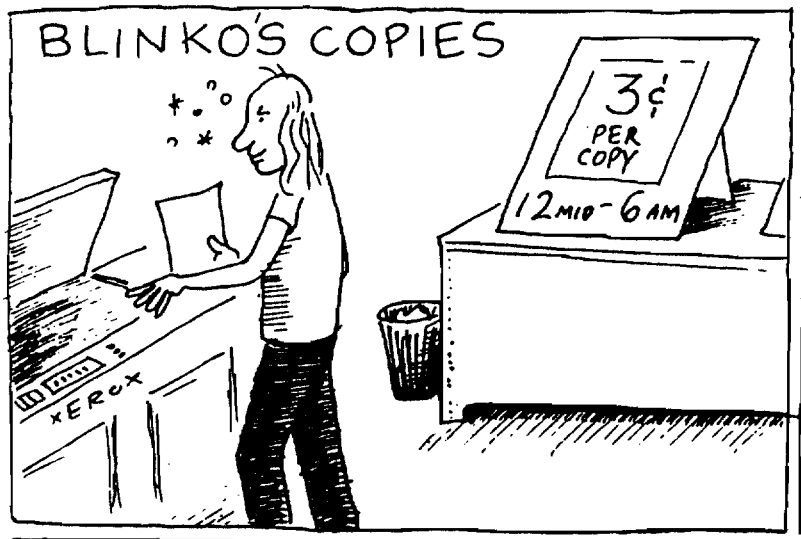
WHAT'S AHEAD

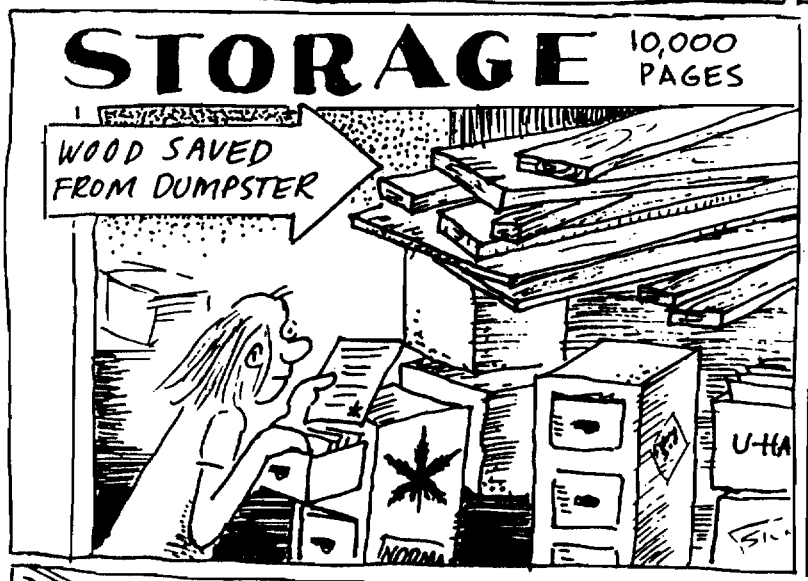
MAINTENANCE

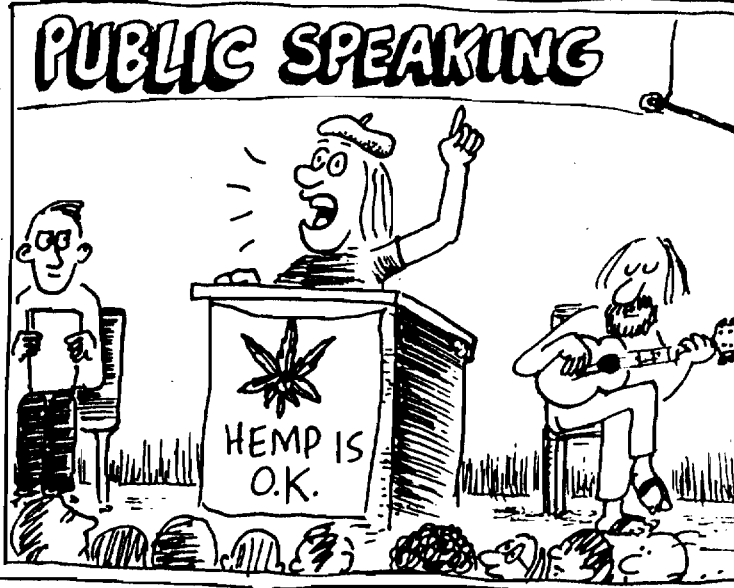
Valve selection plays major role in Stone Container's upgrade at Uncasville, Conn., corrugating medium mill; repair and rebuild considerations for paper machine gear drives; use of the impact method for dynamic balance of paper machine dryers and rollers; benefits of applying advanced computer technology to predictive and preventive monitoring systems; how-to report on freeze-proofing a pulp and paper mill; computer control of bearing temperatures in oil-heated paper machine cylinders

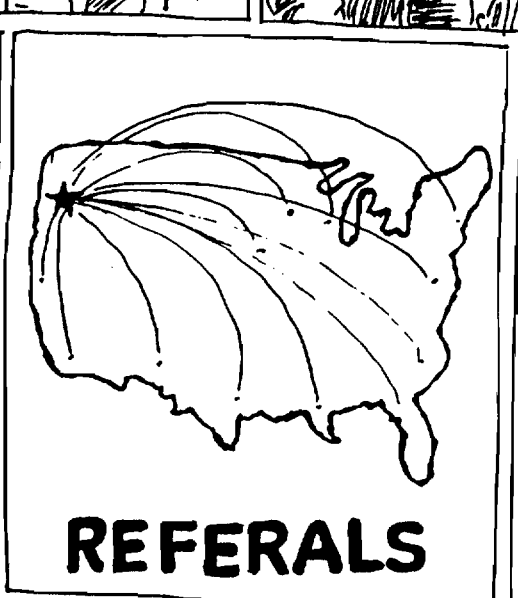
PULPWOOD PROCESSING

Profile of woodyard rebuild at Federal Paper Board's Augusta, Ga., bleached paperboard mill; Port Townsend Paper installs advanced chip thickness screening system at its Port Townsend, Wash., mill; in-wood flail delimber-debarker produces quality chips comparable to woodyard chippers; overview of newest technology for woodyards, woodrooms, and overall wood processing









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The Cannabis Research Institute is a not-for-profit educational and research organization devoted to the reemergence of annual fiber crops as a resource.

The Cannabis Research Institute has been researching material since 1985 and has utilized the services of The Library of Congress, The Carnagie Library in Pittsburgh, The Oregon State Library, The Multnomah County Library and other research facilities as well as private collections.

Material from the Institute's research has been reproduced in **The Emperor Wears No Clothes**, **High Times Hemp Special**, and **Hemp, Lifeline to the Future**.

The Cannabis Research Institute also provides information to individuals and organizations, speakers and entertainment for public events and media appearances, and provides referrals to other organizations.

Currently the Cannabis Research Institute maintains an office at 333 S.W. Park Avenue #501, Portland, Oregon 97211 and is providing information for the forthcoming book, **Hemp Today**, scheduled for publication in the fall of 1994.

Barry Joe Stull,

Cannabis Research Institute

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