



(12) **United States Plant Patent**
McGranahan et al.

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(54) **WALNUT TREE NAMED ‘SEXTON’**

(50) Latin Name: *Juglans regia*
Varietal Denomination: **Sexton**

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(57) **ABSTRACT**

A new and distinct variety of walnut tree denominated ‘Sexton’ is described. This new cultivar comes into bearing young and produces well mid-season. It bears a jumbo sized nut with a strong, well filled shell which is easily removed and contains light to extra light colored kernels with little size variation in a given harvest. The new tree also shows low susceptibility to walnut blight.

7 Drawing Sheets

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FIELD OF THE INVENTION

Botanical/commercial classification: (*Juglans regia*)/new English walnut variety. Varietal denomination: cv. Sexton.

BACKGROUND OF THE INVENTION

The present invention relates to a new and distinct variety of walnut tree *Juglans regia* which has been denominated varietally as ‘Sexton,’ and more particularly to such a walnut tree which has a harvest date approximately one week earlier than the walnut tree variety ‘Chandler’ (U.S. Plant Pat. No. 4,388) and which further produces a walnut that is jumbo in size with a smooth, tan colored shell, and light colored kernels which can be processed in shell or cracked.

It has long been recognized as desirable to provide walnut trees bearing large crops which are ripe for commercial harvesting and shipment midseason and exhibit low susceptibility to walnut blight. The tree of the present variety, ‘Sexton,’ produces a nut which is similar in some respects to common walnut tree varieties such as ‘Chandler,’ (U.S. Plant Pat. No. 4,388) and ‘Tulare’ (U.S. Plant Pat. No. 8,268). However the new variety is ready for harvest approximately one week before ‘Chandler,’ and two weeks after the common reference cultivar ‘Payne’ (not patented).

The new *Juglans regia* walnut tree of the present invention was created at Davis, Calif. in 1990 by a controlled cross of the cultivar ‘Chandler’ (U.S. Plant Pat. No. 4,388) and UC 85-8 (not patented). The pedigree is illustrated (FIG. 1). UC85-8 is a germplasm introduction which originated in the Xinjiang Province of China, and was provided by Xi, Sheng ke, Chinese Academy of Forestry, Beijing.

Seeds from the cross were planted and the resulting 31 trees were carefully observed along with other trees in the walnut breeding program. When they began to bear nuts, data were collected annually on leafing date, first peak and

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last female flower bloom, first, peak and last male bloom, blight severity and yield (Table 1). Nuts were sampled, cracked, and data was collected on shell appearance, shell thickness, shell integrity, shell strength, nut weight, kernel weight, percent kernel, ease of kernel removal, kernel color, and percent kernel shrivel (Table 2). A single tree was selected from among progeny of this controlled cross based on its superior attributes. This selection was originally designated ‘UC90-31-10,’ and is now designated the ‘Sexton’ cultivar after Joseph Sexton, a historical figure said be responsible for the soft shell walnut industry in Southern California. ‘Sexton’ was originally asexually reproduced by grafting in Davis, Calif., Parlier, Calif., and Chico, Calif. ‘Sexton’ is stable and reproduces true to type.

SUMMARY OF THE INVENTION

It was found that the new *Juglans regia* of the present invention exhibits the following combination of characteristics:

- a) Comes into bearing young, at age 3 years;
- b) forms jumbo-sized walnuts that possess strong well-filled shells and easy to remove light-colored kernels with little size variation in a given harvest;
- c) can be processed inshell or cracked;
- d) bears fruit laterally;
- e) yields a walnut crop that can be harvested in the middle of the harvest season and prior to ‘Chandler’ (U.S. Plant Pat. No. 4,388);
- f) and exhibits low susceptibility to blight.

BRIEF DESCRIPTION OF THE TABLES

- Table 1 shows comparative tree evaluations.
- Table 2 shows nut and kernel traits.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1—shows the pedigree of the ‘Sexton’ walnut.

FIG. 2—shows a tree of the ‘Sexton’ walnut at 12 years of age.

FIG. 3—shows a near view of the typical current season’s stem of the ‘Sexton’ walnut.

FIG. 4—shows a near view of the leaves of the ‘Sexton’ walnut.

FIG. 5—shows a near view of the bark of the ‘Sexton’ walnut.

FIG. 6—shows nuts in the hull of the ‘Sexton’ walnut.

FIG. 7—shows nuts and kernels of the ‘Sexton’ walnut.

BOTANICAL DESCRIPTION OF THE PLANT

The description is based on an ungrafted walnut on its own roots and trees propagated by grafting on Paradox rootstock and growing in an orchard at Davis, Calif. Data were collected on the own rooted tree from 1994, age 3 years, to 2003, age 12 years. In 2000, scionwood from this tree was collected and grafted onto Paradox rootstock for further evaluation in three sites: Davis, Chico and Kearney. Data is summarized in Tables 1 and 2.

The Munsell Book of Color is used in the identification of color. Also, common color terms are to be accorded their ordinary dictionary significance.

Botanical classification: *Juglans regia*.

Female parent.—‘Chandler’ (U.S. Plant Pat. No. 4,388).

Male parent.—UC85-8 (non-patented in the United States).

The pedigree is shown (FIG. 1). ‘Sexton’ differs from its male parent UC85-8 in having lighter colored kernels and less tendency to have “second blooms” which is commercially undesirable. It is also a smaller tree and has a phenology between its two parents.

Plant: The growth habit of the tree is illustrated in FIG. 2. This 12 year old tree was approximately 15 feet in height with a canopy diameter of approximately 17 feet. The trunk diameter at 30 cm above the ground is approximately 25 cm. The silver grey bark (as illustrated) is typical of *Juglans regia*. The young bark is brown (8.0YR 3.0/5.4) with numerous raised lenticels (FIG. 3) ‘Sexton’'s lenticels are oval, measure 2–10 mm by 1–2 mm and are light grey yellow brown (9.7YR 4.6/2.1). ‘Sexton’'s bark color is yellow grey (3.8Y 7.4/1.4) with lighter brown-grey striations (7.0YR 5.4/1.2) (FIG. 5). On one to two year old bark there are about 32 lenticels per 2.5 cm of stem measuring approximately 1.5 cm in diameter. ‘Sexton’ has less than average vigor and is comparable to the variety ‘Howard’. The surface texture of the trunk, branch, leaflets, hull and kernel is smooth.

Foliage: The dark green foliage is illustrated (FIG. 4) and is typical of *Juglans regia*. Leaf out during 1994–2003 has occurred on March 29 on the average. For comparative purposes the ‘Payne’ cultivar leafed out 11 days earlier and the ‘Chandler’ cultivar leafed out 6 days later during the same years. The typical leaf coloration is green, 8.2GY 3.2/6.1, on the upper surface and slightly lighter (5.3GY 5.2/9.7) on the lower surface. The leaves are pinnately compound with 5–7 leaflets. The full leaf length is approximately 38 cm and the width 28 cm. The terminal leaflet averages 15.6 cm in length and 9.5 cm in width. The middle leaflets average 14 cm in length and 6.6 cm in width and the proximal leaflets average 12.1 cm in length and 6.2 cm in width. If 7 leaflets are present the first (proximal) set is

smallest averaging 9.6 cm in length and 5.7 cm in width. The leaflets are broadly elliptical and entire. The petiole averages 24 cm in length and is 2–4 mm in diameter. The entire rachis including the petiole is 24 cm in length, 2–4 mm in diameter and the distance to the first leaflet (petiole) is 7 cm. The color is yellow-green 5GY 6/8.

Inflorescence: The tree is relatively precocious, first female flowers being noted at age 3 years. Male flowers (catkins) were not present until age 5 years. This delay in male maturity is typical of *Juglans regia*. From 1994 to 2002 first female bloom occurred on an average on April 9, peak bloom on April 13 and last bloom on April 19. From 1996 to 2002 average male flowering (pollen shedding) began April 4, peaked on April 8 and terminated April 17. In this protandrous tree, pollen shedding does not completely cover pistillate bloom suggesting that a pollenizer would be needed for maximum yield in isolated areas. Both ‘Tulare’ and ‘Chandler’ would be satisfactory pollenizers. The female flowers are typical of *Juglans regia* with two flowers per inflorescence borne at both terminal and lateral positions on current season’s growth. Approximately 100% of the lateral buds contain inflorescences making yields much greater than trees that only bear flowers terminally. A typical female flower is approximately 5 to 7 mm at anthesis and the floral organs are typical of *J. regia*. The flower fragrance is typical of *J. regia* and is not noticeably different than the foliage fragrance. The flowers are typical of the species appearing vase shaped when the two plumose stigmatic arms are curved outwardly. There are no petals. The flowers measure 5–7 mm in length and 3–5 mm in diameter and are yellow-green (5GY 6/8) in color. They are borne usually in twos on a 1 cm spike. The male flowers are plentiful and measure about 8.5 cm in length. The catkin’s diameter is about 15 mm and yellow-green (5GY 6/8). Catkin length ranges between 7 and 13 cm, averaging 8.5 cm.

Walnuts: The new cultivar commonly harvests at least one week before ‘Chandler’ and two weeks after ‘Payne’ but may become earlier as the clone ages. During 2002, nuts of this new cultivar were ready for harvest on October 3. This compares with ‘Payne’ which harvested September 17 and ‘Chandler’ that harvested October 8. The new cultivar has excellent yields of jumbo sized walnuts. The hull is globose, moderate yellow-green (5GY 5/6), measures 4.7 cm long and 5.2 cm wide and is 4.3 mm thick. The almost round nutshell is tan, smooth, and measures approximately 37.9 mm in length and 37.1 mm in width. The nut’s basal and apex shape is rounded with a slight tip at the apex. The color is light brown (2Y 5/6). The shell is strong and well sealed and the kernel is easy to remove. The kernel weighs 8.5 g and makes up 51.8% of the total nut weight of 16.4 g. Kernel color is considered excellent and scores mostly in the light to extra light categories of the USDA Standards for Grades of Shelled Walnuts as determined by using the standard Walnut Color Chart for kernels published by the Dried Fruit Association of California. In addition kernels of ‘Sexton’ scored 52.2 on the Relative Light Index used by Diamond Walnut of Stockton, Calif. The kernels do not have a shiny surface like the ‘Chandler’ walnut does. These values are based on 9 year averages of ten walnut samples obtained from a young tree. Typical kernel dimensions are approximately 31.9 mm in length and 30.5 mm in width. The kernel is essentially round and splits into halves easily. It is plump in comparison to ‘Chandler’. It is typical of commercial walnuts in terms of flavor and firmness, the latter varying according to the percent moisture after drying.

Hardiness: Trees have withstood temperatures of 21° F. in 1998.

Chilling requirement: Trees exhibited staggered leafing and bloom, symptoms of lack of chilling in 1998, a year when chilling hour accumulation (hours under 45° F.) were

717. This was not noted when chilling hour accumulation was over 800.

Disease resistance and susceptibility: Susceptibility to walnut blight has been low. No other unusual resistance or susceptibility to insects and diseases has been observed to date.

Usage: The new cultivar of the present invention provides an early harvesting walnut cultivar with light colored kernels that can be used cracked or in shell.

TABLE 1

TREE EVALUATIONS								
	Leaf- ing date	DAP L	Male bloom date	DAP M	Female bloom date	DAP F	Har- vest Date	DAP H
1999								
Payne	3/24	0	4/14	0	4/18	0	9/24	0
Tulare	4/10	17	4/17	3	4/25	7	10/5	11
Chandler	4/13	20	4/17	3	4/28	10	10/19	25
Sexton	4/6	13	4/18	4	4/19	1	10/1	7
Gillet	4/11	18			4/22	4	10/10	16
Forde	4/14	21			4/23	5	10/22	28
2000								
Payne	3/19	0	3/31	0	4/5	0	9/13	0
Tulare	4/3	15	4/11	11	4/16	10	10/3	20
Chandler	4/4	16	4/12	12	4/20	15	10/12	29
Sexton	3/28	9	4/5	5	4/10	5	9/30	17
Gillet	3/30	11			4/7	2	9/26	13
Forde	4/3	15			4/10	5	10/7	24
2001								
Payne	3/17	0	3/27	0	4/1	0	9/9	0
Tulare	3/29	12	4/10	13	4/20	20	9/27	15
Chandler	3/29	12	4/10	13	4/23	22	10/7	28
Sexton	3/22	5	3/26	0	4/7	6	9/29	20
Gillet	3/23	6	4/15	18	3/30	-2	9/18	9
Forde	3/24	7	4/15	18	4/3	2	9/29	20
2002								
Payne	3/27	0	4/6	0	4/12	0	9/18	0
Tulare	4/6	10	4/15	9	4/24	12	10/3	16
Chandler	4/7	11	4/17	11	4/27	15	10/9	21
Sexton	4/1	5	4/10	4	4/15	3	10/3	15
Gillet	4/1	5	4/23	17	4/11	-1	10/4	16
Forde	4/2	6	4/23	17	4/13	1	10/6	18
2003								
Payne	3/18	0	4/5	0	4/9	0	9/21	0
Tulare	4/5	18	4/18	13	4/26	17	10/5	14
Chandler	4/7	20	4/20	15	5/3	25	10/10	19
Sexton	3/24	6	4/5	0	4/9	0	10/6	15
Gillet	3/24	6	4/18	13	4/4	-5	10/1	10
Forde	3/27	9	4/23	18	4/9	0	10/3	12
5 YEAR AVERAGE								
Payne	3/21	0	4/4	0	4/9	0	9/17	0
Tulare	4/4	14	4/14	10	4/22	13	10/3	17
Chandler	4/7	16	4/15	11	4/26	17	10/11	24
Sexton	3/29	8	4/6	2	4/12	3	10/1	15
Gillet	3/30	9	4/19	16	4/8	0	9/30	13
Forde	4/1	11	4/20	18	4/12	3	10/7	20
	Season length	Overlap %	Male abun- dance	Female abun- dance	Lateral fruit- fulness %	Yield	Blight	
1999								
Payne	159	89	6	7	100	6	3	
Tulare	166	27	4	6	90	6	0	
Chandler	174	53	4	5	90	5	3	
Sexton	165	88	6	7	100	7	2	
Gillet	171			5	90	5	0	
Forde	182			6	100	4	0	

TABLE 1-continued

TREE EVALUATIONS							
2000							
Payne	161	89	6	6	100	6	5
Tulare	172	100	6	6	100	6	4
Chandler	175	67	4	5	90	4	0
Sexton	173	54	5	6	100	6	0
Gillet	172			6	100	6	0
Forde	180			5	100	6	0
2001							
Payne	161	89	7	6	100	5	8
Tulare	160	85	6	6	70	5	3
Chandler	167	38	5	5	100	4	2
Sexton	175	53	5	6	100	6	1
Gillet	172		3	6	100	7	0
Forde	179		2	6	100	7	0
2002							
Payne	159	60	7	6	100	7	3
Tulare	162	91	5	6	100	6	0
Chandler	165	75	5	6	100	6	1
Sexton	171	83	6	6	100	6	0
Gillet	176	40	4	6	100	6	0
Forde	176	11	4	6	100	6	0
2003							
Payne	165	62	5	6	100	6	7
Tulare	164	92	5	6	100	6	5
Chandler	160	50	4	6	100	4	0
Sexton	180	100	5	6	100	6	2
Gillet	180	42	6	6	100	7	1
Forde	177	20	4	6	100	7	2
5 YEAR AVERAGE							
Payne	161	78	6.2	6.2	100	6	5.2
Tulare	165	79	5.2	6	92	5.8	2.4
Chandler	168	57	4.4	5.4	96	4.6	1.2
Sexton	173	76	5.4	6.2	100	6.2	1
Gillet	174	41	4.3	5.8	98	6.2	0.2
Forde	179	15	3.3	5.8	100	6	0.4
KEY TO TABLE 1							
Leafing date	Date when 50% of terminal buds have enlarged and the bud scales have split exposing the green leaves						
DAP L	Days after Payne (reference cultivar) leafing						
Male bloom date	Date when maximum pollen shedding occurs						
DAP M	Days after Payne (reference cultivar) male bloom						
Female bloom date	Date of maximum pistillate flower receptivity						
DAP F	Days after Payne (reference cultivar) female bloom						
Harvest Date	Date when 95% of the nuts separate from the hulls						
DAP H	Days after Payne (reference cultivar) harvest						
Season length	Days between female flowering and harvest						
Overlap %	Percent of female bloom overlapped by male bloom						
Male abundance	Male flower abundance: 3 low; 5 intermediate; 7 high						
Female abundance	Female flower abundance: 3 low; 5 intermediate; 7 high						
Lateral fruitfulness %	Percent of lateral buds with female flowers						
Yield	Yield: 3 low; 5 intermediate; 7 high						
Blight	Blight incidence: 3 low; 5 intermediate; 7 high						
DFA Dried Fruit Association of CA							

TABLE 2-continued

NUT AND KERNEL TRAITS							
Chandler	5	4	5	4	7	1.2	5
Sexton	5	5	6	6	7	1.5	5
Gillet	5	5	3	5	7	1.5	5
Forde	5	5	5	5	7	1.6	5
2000							
Payne	5	5	5	5	7	1.4	5
Tulare	6	6	4	5	7	1.3	5
Chandler	5	5	5	4	7	1.4	5
Sexton	4	6	5	6	7	1.7	5
Gillet	6	5	4	4	7	1.3	5
Forde	6	5	4	5	7	1.2	5
2001							
Payne	5	5	5	5	7	1.5	5
Tulare	5	6	5	4	7	1.3	5
Chandler	5	4	5	4	7	1.5	5
Sexton	4	5	5	5	7	1.6	5
Gillet	5	5	4	4	7	1.2	5
Forde	5	5	5	5	7	1.5	5
2002							
Payne	5	5	5	5	7	1.0	5
Tulare	5	5	5	4	7	1.2	5
Chandler	5	4	5	5	7	1.5	5
Sexton	4	5	5	5	7	1.4	5
Gillet	5	5	4	5	7	1.3	5
Forde	5	4	5	5	7	1.5	5
2003							
Payne	5	5	5	6	7	1.6	5
Tulare	5	6	5	4	7	1.2	5
Chandler	5	4	5	4	7	1.3	5
Sexton	4	5	5	5	7	1.5	5
Gillet	5	5	5	5	7	1.3	5
Forde	6	5	6	6	7	1.6	5
5 YEAR AVERAGE							
Payne	5	5	5	5.2	7	1.4	5
Tulare	5.2	5.6	4.6	4.2	7	1.2	5
Chandler	5	4.2	5	4.2	7	1.4	5
Sexton	4.2	5.2	5.2	5.4	7	1.5	5
Gillet	5.2	5	4	4.6	7	1.3	5
Forde	5.4	4.8	5	5.2	7	1.5	5
KERNEL							
	Inshell weight	Kernel weight	Kernel %	Plump-ness Fill	Ease of removal	Blanks %	
1999							
Payne	16.9	5.3	44.9	5	4	4	0
Tulare	14.0	7.7	57.7	5	5	4	0
Chandler	13.7	7.1	52.2	4	5	3	0
Sexton	14.2	6.9	48.4	5	5	4	0
Gillet	16.5	8.2	49.8	5	4	5	0
Forde	18.6	9.7	51.7	5	6	5	0
2000							
Payne	12.8	6.1	48.0	5	5	4	0
Tulare	16.4	9.2	56.5	5	5	5	0
Chandler	13.7	6.7	49.1	5	4	4	0
Sexton	17.0	8.6	50.7	6	5	5	0
Gillet	17.0	9.0	52.9	5	4	5	0
Forde	17.3	10.3	58.8	5	6	4	0
2001							
Payne	15.4	7.4	48.2	5	5	5	0
Tulare	16.9	8.8	52.5	5	5	5	0
Chandler	15.0	7.5	49.7	4	4	4	0
Sexton	16.0	8.2	51.2	6	5	5	0
Gillet	15.0	8.1	63.6	5	4	5	0
Forde	15.1	8.0	53.0	5	5	5	0

TABLE 2-continued

NUT AND KERNEL TRAITS							
2002							
Payne	12.1	5.6	46.6	5	5	5	0
Tulare	15.0	6.2	55.0	5	5	5	0
Chandler	13.7	6.2	45.4	4	4	4	0
Sexton	18.5	9.9	53.4	6	6	5	0
Gillet	15.2	7.7	50.6	5	5	5	0
Forde	16.7	8.9	53.4	5	5	4	0
2003							
Payne	15.6	7.4	47.1	5	5	5	0
Tulare	15.2	6.5	55.9	6	5	4	10
Chandler	13.8	7.1	51.1	5	4	4	0
Sexton	15.4	7.7	50.2	5	5	5	0
Gillet	16.2	8.2	50.5	5	5	5	0
Forde	17.6	9.1	51.7	5	5	4	0
5 YEAR AVERAGE							
Payne	14.6	6.4	47	5	4.8	4.6	0
Tulare	15.5	8.5	55.5	5.2	5	4.6	2
Chandler	14	6.9	49.5	4.4	4.2	3.6	0
Sexton	16.2	8.3	50.8	5.6	5	4.6	0
Gillet	16	8.2	51.6	5	4.4	5	0
Forde	17.1	9.2	53.7	5	5.4	4.4	0
KERNEL							
	Extra light %	Light %	Light amber %	Amber %	Tip shrivel %	Other shrivel %	Veins %
1999							
Payne	50	30	20	0	0	20	30
Tulare	0	100	0	0	0	0	0
Chandler	90	10	0	0	30	0	0
Sexton	100	0	0	0	20	0	0
Gillet	0	100	0	0	0	0	0
Forde	0	100	0	0	0	0	0
2000							
Payne	0	100	0	0	1	0	30
Tulare	0	100	0	0	1	0	0
Chandler	60	40	0	0	40	0	0
Sexton	0	80	20	0	10	0	10
Gillet	0	90	10	0	20	0	20
Forde	0	90	0	10	10	0	0
2001							
Payne	30	70	0	0	0	0	20
Tulare	0	100	0	0	20	0	0
Chandler	100	0	0	0	10	0	0
Sexton	40	80	0	0	10	0	10
Gillet	0	90	10	0	0	0	0
Forde	0	90	10	0	0	0	0
2002							
Payne	0	90	10	0	0	0	0
Tulare	0	100	0	0	0	0	0
Chandler	100	0	0	0	40	0	0
Sexton	50	50	0	0	0	0	0
Gillet	0	100	0	0	0	10	10
Forde	100	0	0	0	0	0	0
2003							
Payne	0	90	10	0	0	0	10
Tulare	33	67	0	0	0	0	0
Chandler	100	0	0	0	20	0	0
Sexton	40	40	20	0	20	20	0
Gillet	10	90	0	0	10	0	0
Forde	50	50	0	0	10	0	0
5 YEAR AVERAGE							
Payne	16	76	8	0	0.2	4	18
Tulare	7	93	0	0	4	0	0
Chandler	90	10	0	0	28	0	0

TABLE 2-continued							
NUT AND KERNEL TRAITS							
Sexton	46	46	6	0	12	4	4
Gillet	2	94	4	0	6	2	6
Forde	30	56	2	2	4	0	0
KEY FOR TABLE 2							
Texture	Shell texture: 3 smooth; 5 medium; 7 rough						
Color	Shell color: 3 light; 5 medium; 7 dark						
Seal	Shell seal: 3 weak; 5 intermediate; 7 strong						
Strength	Shell strength: 3 weak; 5 intermediate; 7 strong						
Integrity	Shell integrity: 3 substantial area of shell missing; 5 small area of missing shell; 6 stem end hole; 7 complete shell						
Thickness	Shell thickness at mid-cheek in mm						
Packing tissue	Inner lining: 3 thin; 5 medium; 7 thick						
Inshell weight	gm						
Kernel weight	gm						
Kernel %	Kernel wt/ inshell wt × 100						
Fill	Kernel fill: 3 poor; 5 moderate; 7 well						

TABLE 2-continued	
NUT AND KERNEL TRAITS	
Plumpness	Kernel plumpness: 3 thin; 5 moderate; 7 plump
Ease of removal	Ease of removal of kernel halves: 3 easy; 5 moderate; 7 difficult
Blanks %	Percent of nuts without a kernel
Extra light %	Percent of kernels in extra light category (DFA)
Light %	Percent of kernels in light category (DFA)
Light amber %	Percent of kernels in light amber category (DFA)
Amber %	Percent of kernels in amber category (DFA)
Tip shrivel %	Percent of kernels with tip shrivel like Chandler
Other shrivel %	Percent of kernels with more substantial shrivel
Veins %	Percent of kernels with conspicuous veins
	DFA Dried Fruit Association of CA

What we claim is:

1. A new and distinct variety of walnut tree substantially as shown and described herein.

* * * * *

WALNUT TREE NAMED ‘SEXTON’

FIG. 1

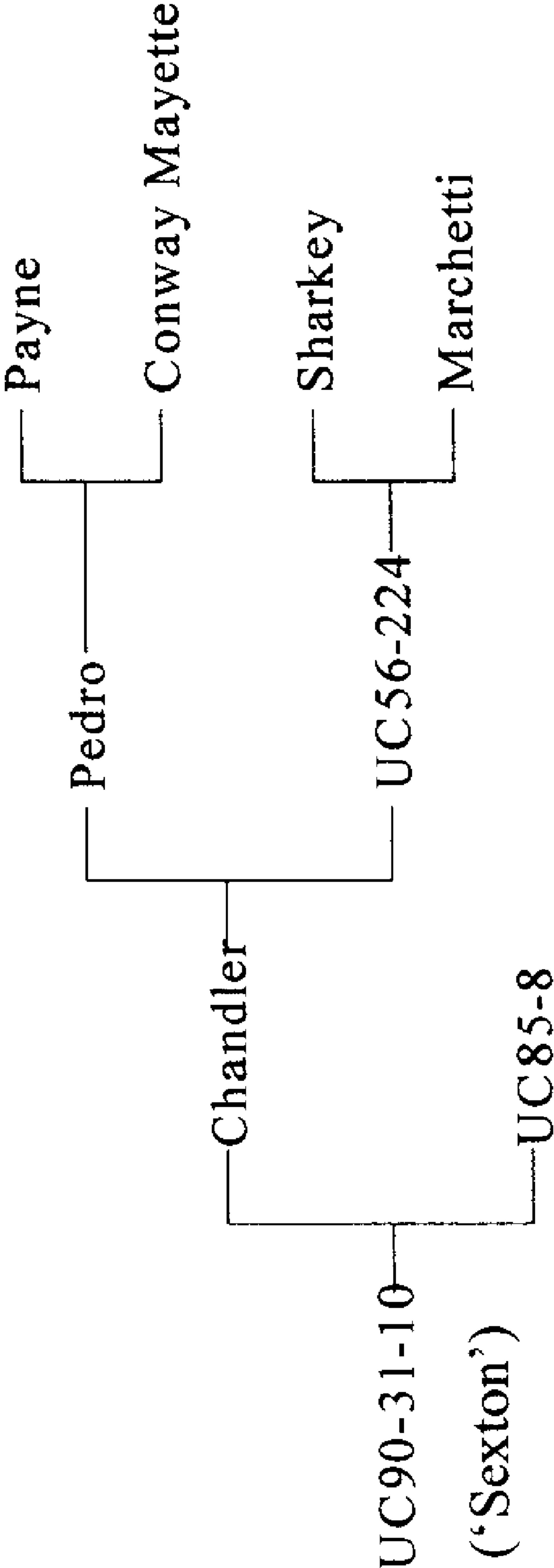


FIG. 2

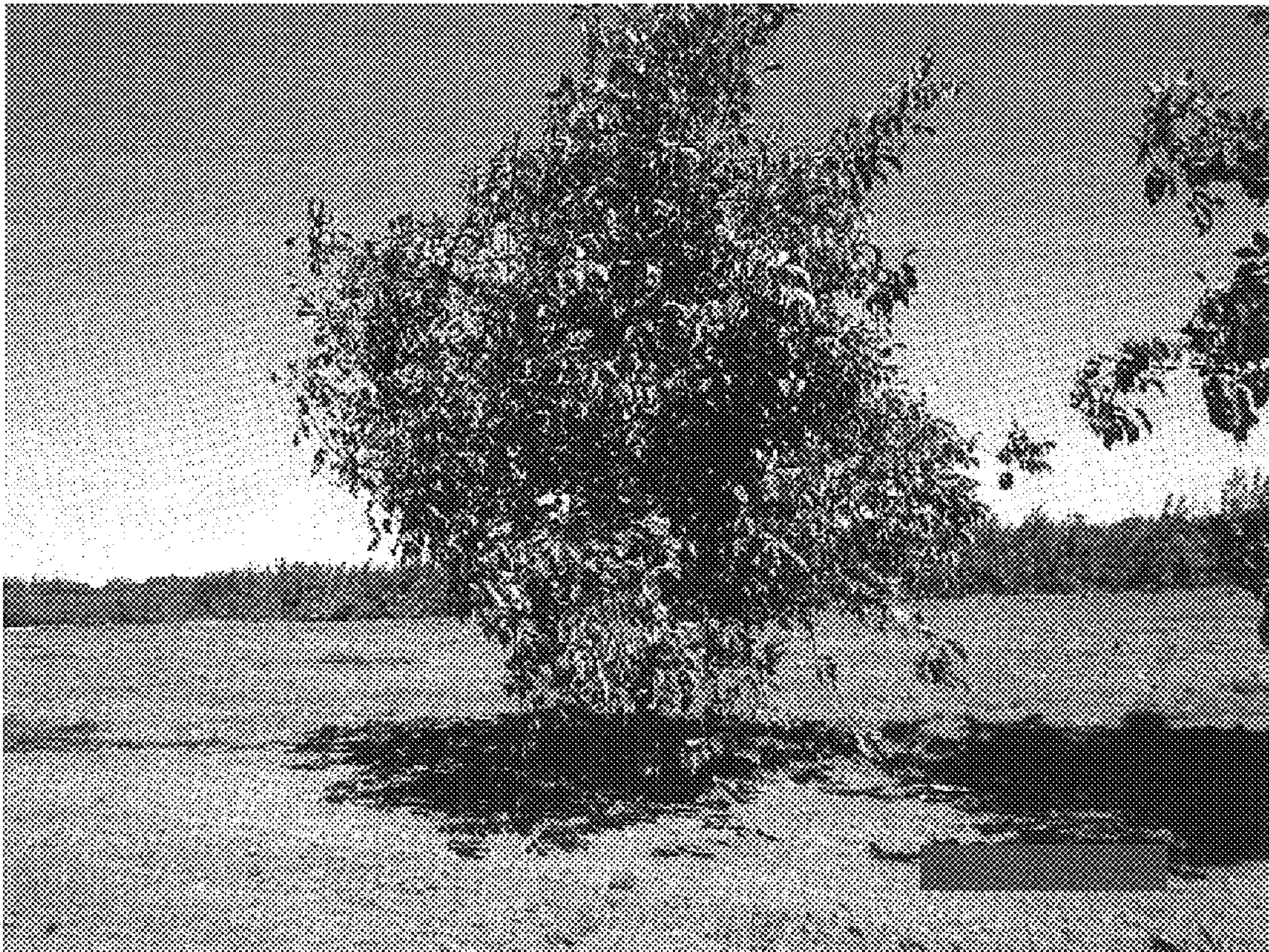


FIG. 3

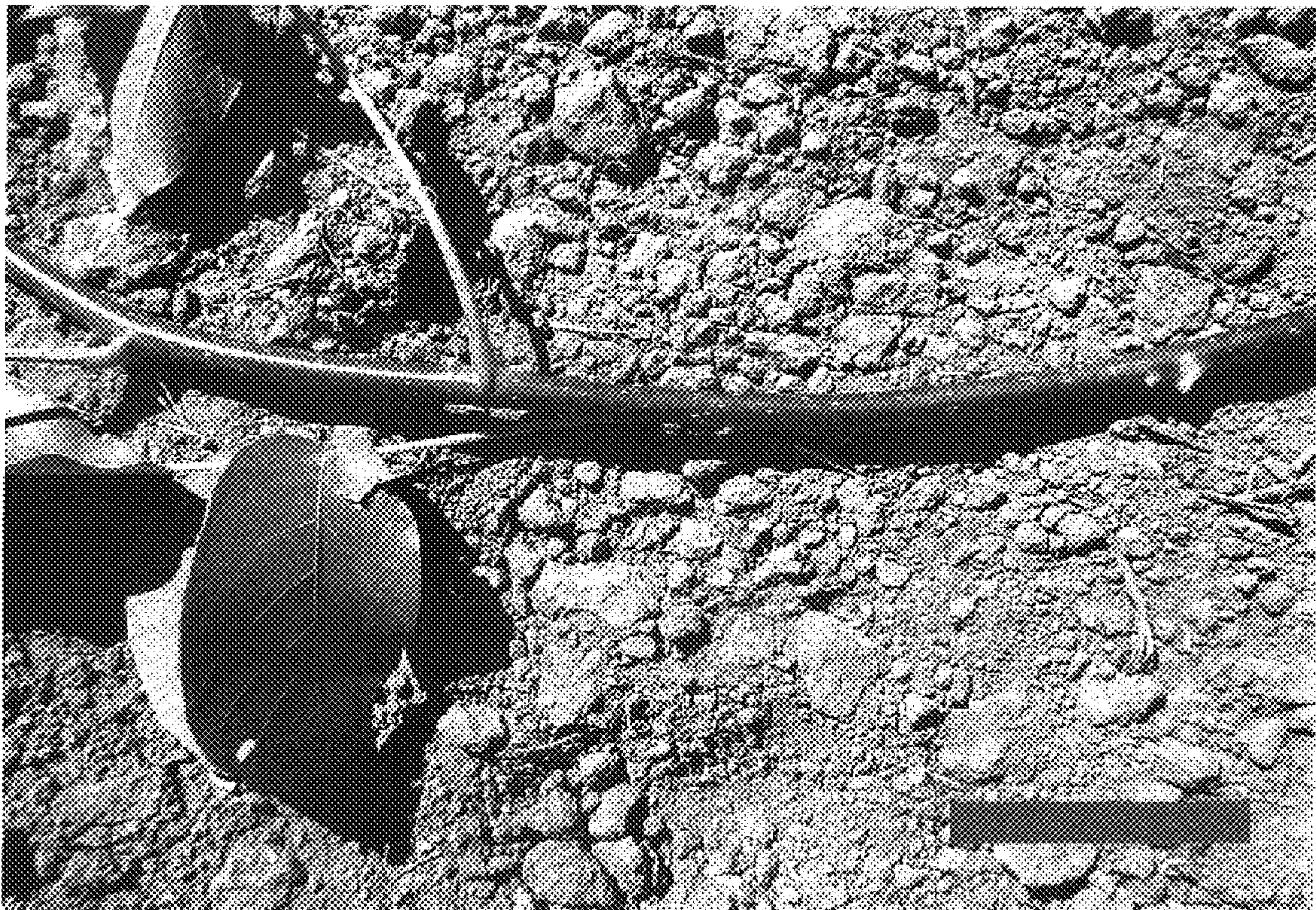


FIG. 4



FIG. 5

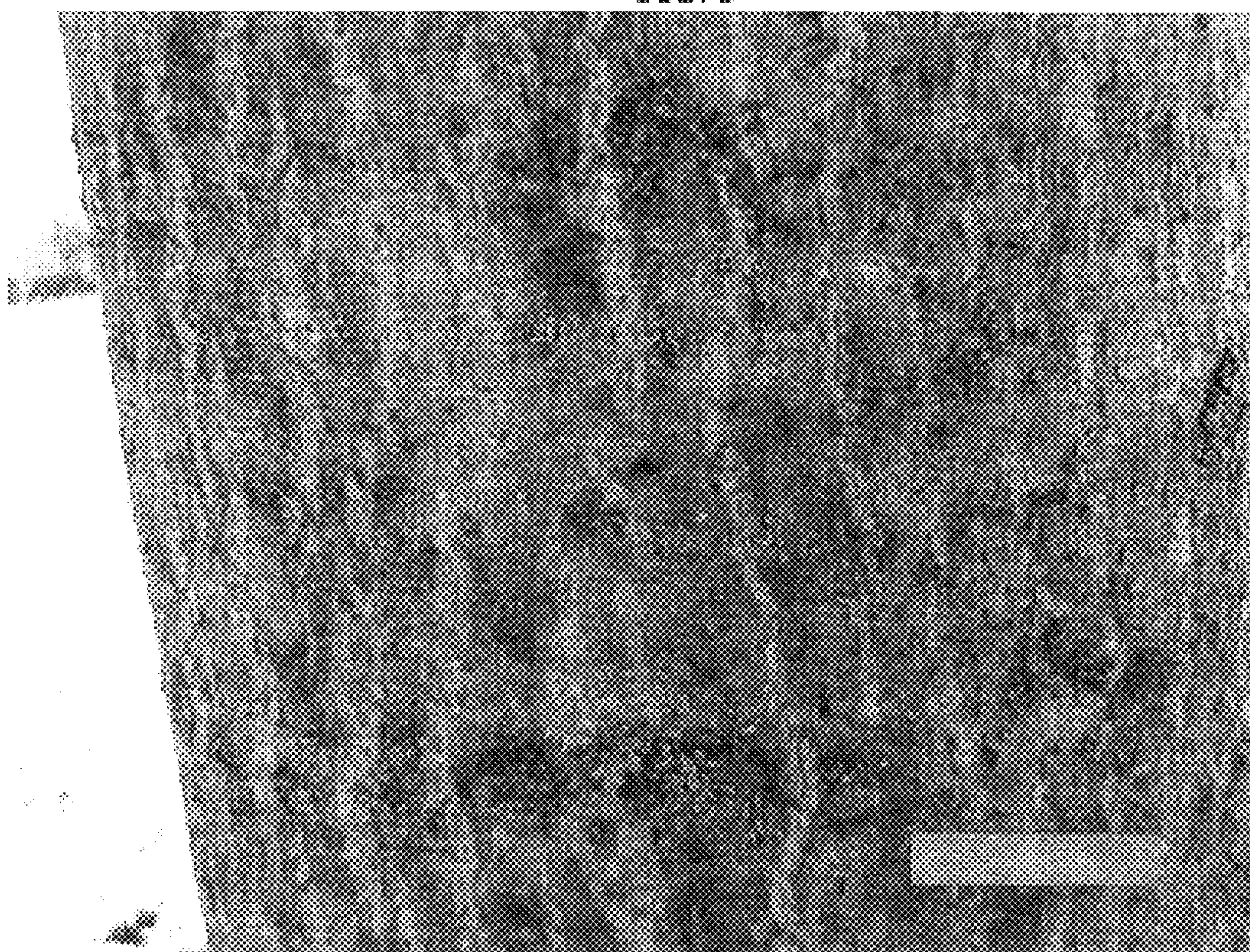


FIG. 6



FIG. 7

