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Progress in Plant Breeding

N.E. Hansen

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AGRICULTURAL EXPERIMENT STATION

SOUTH DAKOTA
STATE COLLEGE OF AGRICULTURE
AND MECHANIC ARTS

Department of Horticulture

PROGRESS IN PLANT BREEDING

1. New Fruits: Plum, Sand Cherry,
Crab Apple, Raspberry.
 2. A New Rose.
 3. Pears Immune to Blight.
 4. A Field Method of Hybridizing Alfalfa.
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BROOKINGS, SOUTH DAKOTA

The Mitchell Publishing Company, Mitchell, S. D.

CORRECTION: PAGE 162.
WANETA PLUM, YEAR OF INTRO-
DUCTION, FOR 1912 READ 1913

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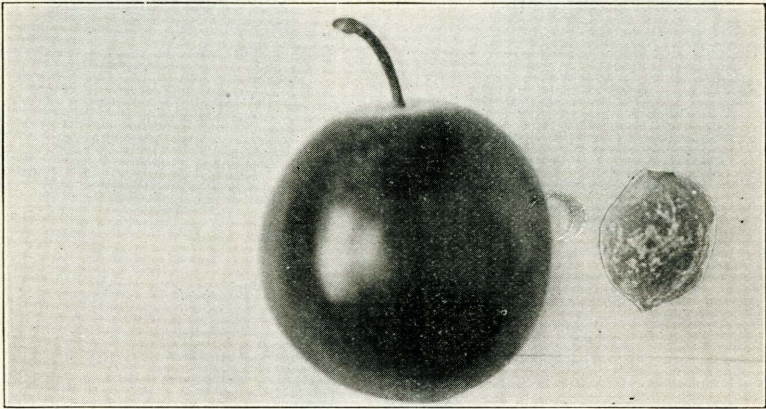
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PROGRESS IN PLANT BREEDING

By N. E. HANSEN, Horticulturist.

The present bulletin is a report of progress in plant-breeding in this Department since the publication of Bulletin 130, June, 1911. It has been the policy of this Department to send out these new varieties as soon after fruiting as possible.

The only test of hardiness of any fruit is its behavior under propagation.



KAHINTA PLUM

Introduced spring 1912. Kahinta is the Sioux Indian name for "sweep." Female parent: the Apple plum, a Japanese variety originated by Luther Burbank of California; male parent, the Terry, a native plum (*Prunus Americana*), originated by the late H. A. Terry of Crescent, Iowa.

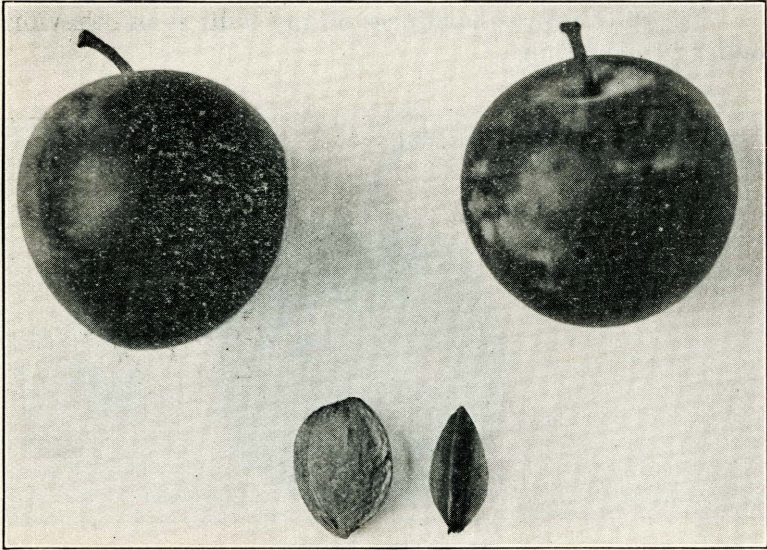
I have several seedlings of this pedigree, all with fruit of excellent quality, approximating that of the peach in excellence.

Fruit $1\frac{1}{2}$ inches in diameter, dark red, roundish, slightly oval, very heavy, the heaviest plum on the ground the very dry season of 1911, weight being about one ounce. Fruit freestone, skin thin, no acerbity; flesh firm, yellow, sweet.

TOKATA PLUM

Introduced spring 1912. Tokata is the Sioux Indian for "go forward." Female parent is the large, firm-fleshed, fragrant apricot plum of China (*Prunus Simoni*), popular in the orchards of California; male parent, De Soto, a well known native plum (*Prunus Americana*) from southwestern Wisconsin.

The four varieties sent out from this Department:



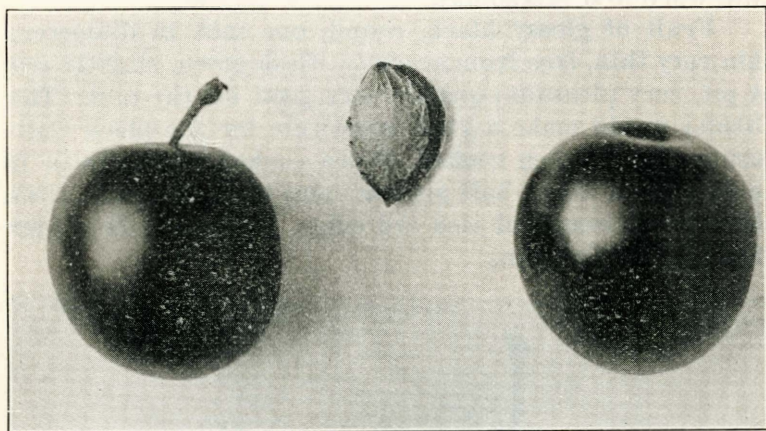
TOKATA PLUM

Hanska, Inkpa, Kaga, Toka, show that the firm flesh and rich fragrance of the apricot of China can be combined successfully with the native northwestern plum, *Prunus Americana*. In a way, the Tokata is a reciprocal hybrid of these two species, since the native plum in this case is the male instead of the female parent.

The fruit is regular in form, roundish, slightly oval, with apex flat. In 1911 the size was $1\frac{3}{8}$ x 1 7-16 inches in diameter. The skin is of a rich dark red, slightly mottled with numerous orange dots suffused in the skin covered with light lilac bloom. The flesh is of a rich orange red color, very firm and with the rich Simoni flavor when fresh

from the tree. Pit free. When cooked a few minutes in sugar syrup the sauce has the rich Chinese apricot flavor, which is superior to any of the native plums and to the ordinary California plums as we receive them in this market. Tree of good upright habit.

As to how far north this variety can be grown remains to be determined by experiment, but it can scarcely be expected to go outside of the natural successful range of the De Soto plum.



OZIYA PLUM

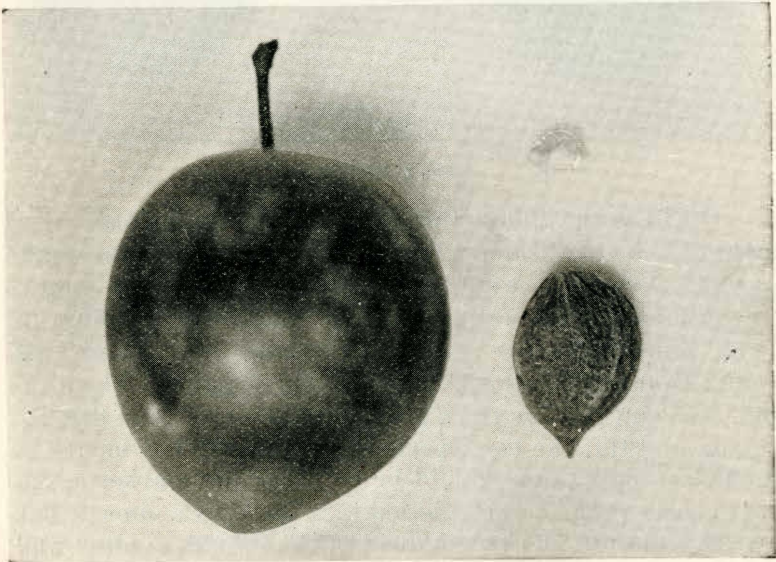
Oziya is the Sioux Indian name for "to refresh." Female parent, Red June, a large early Japanese plum; male parent, DeSoto, a well known native plum from southwestern Wisconsin. Oziya was our earliest large plum in 1911, remarkable for its large size and very bright red color; flesh light yellow and of excellent quality. The original tree and the few trees propagated from it bore heavily season of 1911, the best specimens measured $1\frac{3}{8}$ inches in diameter. This plum should be of value for market as an extra early plum. I am satisfied that the Oziya, since it has a true plum pit, is a true hybrid of the Japanese plum and the native plum, whereas the Skuya, which I supposed to be of the same pedigree, after further study appears to be a sand cherry hybrid, as noted in Bulletin 130. Oziya plum jam is remarkable for its bright cherry color and superb

flavor, the skin cooks soft and disappears entirely and there is no trace of the native plum acerbity.

CIKANA PLUM-SAND-CHERRY

Introduced spring 1912. Cikana is the Sioux Indian name for "small". Of the same pedigree as Opata but much later in season. This pedigree is: Female parent, the Dakota sand cherry (*Prunus Besseyi*); male parent, the Gold plum, a very large hybrid Japanese variety originated by Luther Burbank and for which three thousand dollars was paid when first introduced.

Fruit of glossy black, round, one inch in diameter; skin very thin, free from acerbity; flesh green, slightly red at pit, very pleasant; quality very good for the table. The Cikana would make a good substitute for the black California cherry when cooked. When cooked with pits in it cooks soft in about half an hour and the black skin gives the sauce a beautiful rich red color. The flavor is milder than that of Ezaptan.



WANETA PLUM.

Introduced spring 1912. My belief is that in this variety I have combined the best points of the native and the

Japanese plum. It is probably the largest of over 10,000 seedlings. The size here at Brookings in 1912 was two inches in diameter; weight two ounces. Good red color, skin free from acerbity, flavor delicious. Pedigree the same as Kahinta I introduced in 1912. The female parent is the Apple plum, a large Japanese variety originated by Luther Burbank of California; the male parent is Terry, the largest native (*Prunus Americana*) plum, originated by the late H. A. Terry of Iowa. The Waneta plum was exhibited at the South Dakota State Fair at Huron in September, 1912, by the Horticultural Department of this Station. The Waneta plum has borne the past four successive years. Waneta was a "Yanktonais boy from the wilds of the James River" who won fame in the war of 1812, and became a great chief. An interesting biography of Waneta is given by Doane Robinson in the Department of History Collections of South Dakota, 1904, page 101-108.

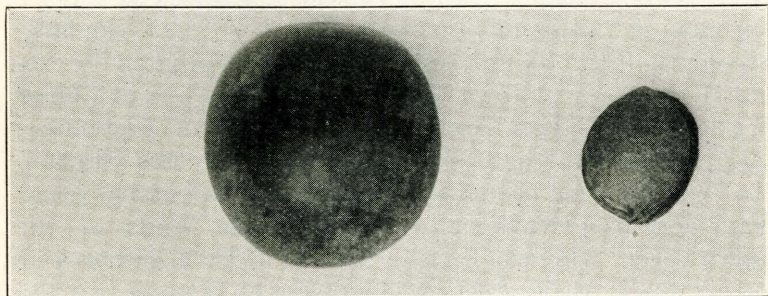
CHAMPA SAND CHERRY.

Introduced spring 1912 by distributing 230 plants 12 to 18 inches, mostly branched, budded on native plum seedlings. Champa is the Sioux Indian name for "cherry." A seedling of the Sioux, one of our pure sand cherry seedlings. The bush is of strong upright growth for a sand cherry, the original plant is about 5 feet.

In quality for table or culinary use, the Sioux seems to be the best out of the many thousands of sand cherry seedlings grown at this station. But the Champa exceeds the Sioux somewhat in size and appears to be the largest sand cherry to date. Color, glossy black; pit small, long rather than round. These pure sand cherries should be gotten on own roots as soon as possible by layering, as budding is expensive. Some of those who have the Sioux and Tomahawk sand cherries are doing this. A unique method, which was introduced by C. W. Gurney of Yankton, S. D., is by "high buds"; that is budding two or three feet from the ground on native plum stock, thus giving a neat round-headed plant, very fruitful and ornamental for the home garden.

These plants should be set a little deeper than they stood in the nursery, making it easier to make layers.

Sand cherries are for dry climates and dry soils, in moist soils and climates they mildew and are unproductive. The drier the soil the better the sand cherry seems to like it, the more the sand cherry is at home. Hence, it deserves a place in the small fruit garden of the western settler.



TETON PLUM

Introduced spring 1912. For many years I have been endeavoring to collect pits and scions of pure wild plums in various parts of South Dakota, both by correspondence and personal field work. My best success in this line was in 1904 in exploring along the Missouri near Campbell, in Campbell county. This tree was found in a small plum thicket a short distance from the Missouri river. The fruit was $1\frac{3}{8}$ inches in diameter, color a good clear red; flesh of good quality. Later in the season I returned to cut scions from three of the trees in this thicket. These trees bore heavily the past season. One of them I have named Teton in honor of the Indian tribe living in that vicinity. This plum is practically a free stone; the skin is thick but cooks readily. It is the best representative of the pure native plum of this state that I have found up to date.

OHTA RASPBERRY.

Introduced spring 1912. Ohta is the Sioux Indian for "much" or "many". This was first noted in 1906 in our plantation of 6,000 hybrid seedling raspberries.. Female parent, a wild red raspberry from Cavalier county in north-eastern North Dakota; male parent, the Minnesota Iron-clad, a red raspberry originated by F. J. Empenger, Maple Plain, Minn., who writes under date of June 25, 1907: "The

origin of the Minnetonka Ironclad is that Turner, Cuthbert and wild raspberries were planted together and when in full bloom I used a branch of the wild on Turner and Cuthbert; and then I used the Turner on the wild and Cuthbert, and then the Cuthbert on Turner and wild. I used seed from all three and mixed it. From this seed I produced the Minnetonka Ironclad. This was about 1890."

The Ohta raspberry is hardy and very productive. Fruit a beautiful red, fairly firm, of good quality. The canes have red-tinted leaves at the tips. As fruited here the Ohta appears sufficiently large for commercial purposes and the bright red color makes the fruit very attractive. The berries run about sixteen to the ounce, with only fair cultivation on open exposed upland prairie. The plants are hardy without winter protection.

AMUR CRAB APPLE.

Introduced spring 1912. Raised from seed of the selected Siberian crab known as *Pyrus baccata cerasifera*. *Cerasifera* means cherry-bearing, referring to the bright cherry-like color of the fruit. The word Amur refers to the Amur River region, the original home of the pure Siberian crab, *Pyrus baccata* in eastern Siberia.

There is a great demand on the market for a medium-sized crab-apple, not too large in size, free from blight, and equal in color to the Transcendent. The Amur is my first attempt in this line after raising thousands of crab apple seedlings. This is offered as an improvement on the Transcendent crab, not in size but in color, being an intense bright red with a light bloom, a beautiful fruit. The jelly of the Amur is a bright ruby red, that of the Transcendent light pink; the Transcendent sauce cooks yellow, that of the Amur a pleasing bright red.

If the tree proves as productive and free from blight elsewhere as at this station Amur will be worthy of trial. The upright habit of the tree and the bright glowing color of the abundant fruit makes the tree very pleasing from an ornamental standpoint, even should the fruit be ranked too small to compete with the larger crabs.



AMUR CRAB APPLE

TETONKAHA, A NEW HYBRID ROSE

Introduced spring 1912. Tetonkaha is the west lake of the chain of lakes known as Lake Oakwood, about eighteen miles northwest of this station. Tetonkaha was an Indian maiden who lost her life many years ago in this vic-

nity as the penalty for saving her white lover and his people from an Indian massacre.

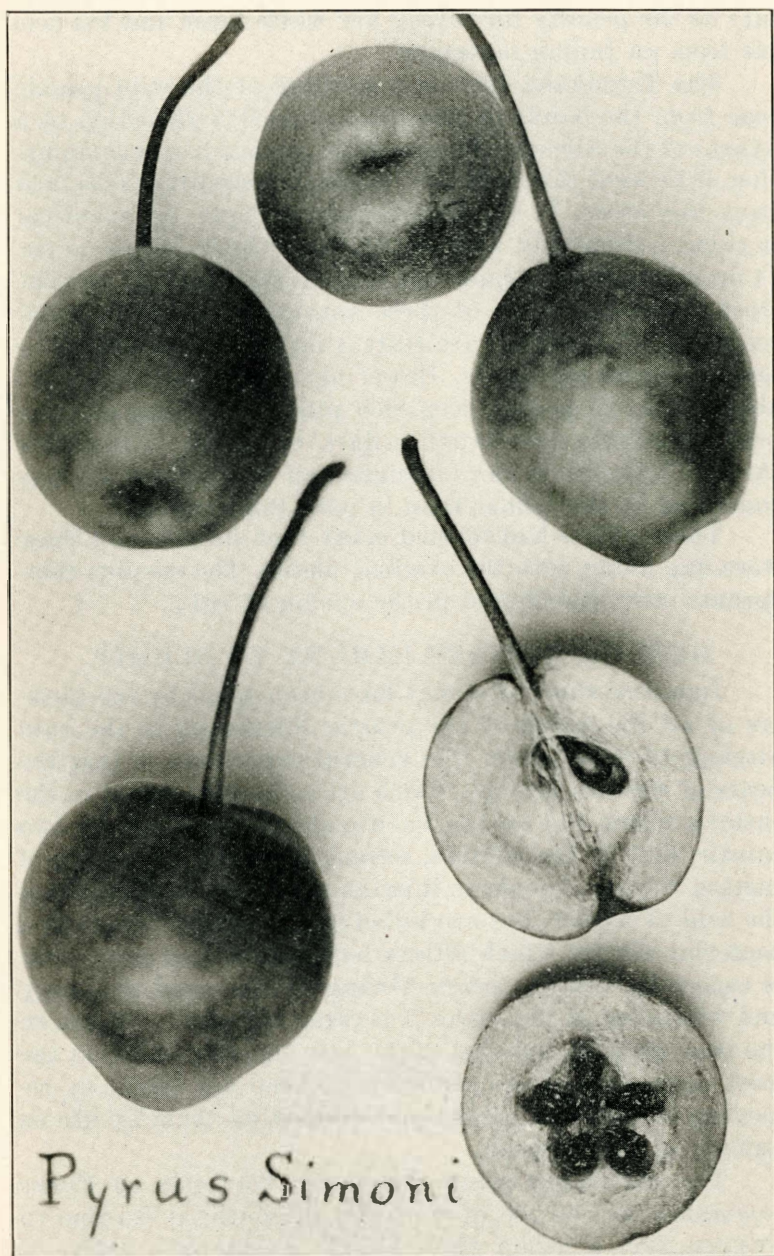
The Tetonkaha Rose is a seedling of the wild prairie rose from the banks of this lake, crossed with pollen of a hybrid of the Siberian *Rosa rugosa*, so that it is a combination of at least three species. In the 100 seedlings obtained from this cross, 74 are double and 26 single. All identical in color, a deep pink, and all fragrant. The blossoms on the 74 double-flowered plants are practically identical and the stock offered consists of these sprouts from the original seedlings. The flowers are fully 3 inches in diameter; the bush is perfectly hardy, flowering abundantly in June; about 18 to 25 petals, deep rich pink; very fragrant; appears desirable for dwarf hedges or as an ornamental shrub. The habit is more upright and the flowers are less concealed by the foliage than in pure *Rosa rugosa*.

These plants had formed many root sprouts and these were dug along with the original plants. The surplus root-sprouts were distributed in the spring of 1912.

BREEDING PEARS IMMUNE TO BLIGHT.

Immense sums of money have been spent by the farmers of all the states of the prairie Northwest in the vain attempt to raise pears. The general experience is that the pears of western Europe, which are so largely raised in the eastern states and on the Pacific slope, are killed by two causes: first by the winters, second by blight. The pears of eastern Europe, known as Russian pears, are hardy against the cold of winter, but are killed by the blight. Blight is a bacterial disease which affects both apples and pears, but is especially fatal to pears. Owing to the rapid browning and withering of the leaves it is often called fire blight. In the pear-growing sections of the east and in California the most strenuous efforts are made to keep out blight by removing the affected shoots and destroying them by fire as quickly as they appear.

The cultivated pears, known to botanists as *Pyrus communis*, are native of central and southern Europe to western Asia, a region where blight, considered a native of northeastern America, is not known. In the thousands of



Fruit of the hardy and blight-proof Sand Pear as fruited at the South Dakota Experiment Station. This is the pear used in breeding the new pears noted in Groups C. and D. in this Bulletin. (N. E. Hansen, Nos. 14 to 39 inclusive.) Fruit juicy, sweet but not highly flavored.

years of its cultivation before its introduction to America the cultivated pear has never had occasion to develop immunity to blight. But the very first question in pear cultivation for us today is, can varieties be developed immune to blight? Is a blight-proof pear a possibility or only an iridescent dream? Some varieties of pears claimed to be blight-proof have appeared from time to time in nursery catalogs, and a number of these have been tested on the Station grounds, but either the winter or blight quickly finished them.

The next step in the work was to determine whether immunity to blight existed in other members of the pear family, and if so, if it could be imparted by crossing with cultivated pears. A number of species have been under trial, but the most promising are the Chinese Sand Pear and the Birch-leaved Pear.

THE CHINESE SAND PEAR.

This is a native to Manchuria, Northern China, Mongolia, the Korean Archipelago and the Ussurie region of eastern Siberia. This has been given various names, *Pyrus Sinensis*, Lindley; *Pyrus Ussuriensis*, Maxim; *Pyrus Simonii*, Carr. As ordinarily cultivated in this country it has been received from China and Japan. The Kieffer and LeConte are hybrids of this species with the European pear, but are not hardy at the north. The matter that has been generally overlooked is that the Sand Pear extends over a vast region differing widely in climatic conditions and that the southern form of the species is not as hardy as the northern form. In the spring of 1899 this Station received trees marked *Pyrus Simonii* from Dr. C. S. Sargent, Director of the Arnold Arboretum, Boston, Massachusetts. These trees have proven perfectly hardy, and have never suffered from blight. Varieties of other pears have been top-grafted on this tree, and they have blighted, but the blight would not affect the rest of the tree. Charles G. Patten, Charles City, Iowa, also has a form of the Chinese Sand Pear which has proven immune to blight. In other places Sand Pears have been under trial which have suffered from winter-killing. As Agricultural Explorer for the United States

Department of Agriculture in 1897, 1906 and 1908, the writer has had occasion to study the question in Siberia. In 1908 especially, the seed from many fruits was saved. The fruit, although very juicy and somewhat sweet, lacks in flavor, but they are largely used in this region. All the seedlings of this Siberian form of the Chinese Sand Pear are perfectly hardy at this Station. Even young seedlings are sufficiently resistant to blight to make this a promising field of work.

THE BIRCH-LEAVED PEAR

Pyrus betulifolia, Bunge, is a native of northern China, and is a choice ornamental tree. Trees of this species were received from a nursery in Germany in the fall of 1896 and have proven perfectly hardy and quite resistant to blight. The fruit is quite small, usually less than one-half inch in diameter, covered with thick russet. *Betulifolia* means birch-leaved, alluding to the shape of the leaf.

TAMING TWO WILD PEARS

The Sand Pear and Birch-leaved Pear have been used freely in crossing with many of the best cultivated pears. With these two species a large number of combinations have been made. Some of the seedlings have proven subject to blight and others have shown immunity so far. It was deemed impossible to determine their relative immunity except by distributing them for trial to people especially interested in this subject. The present month scions of 39 varieties were distributed among 24 men in several states. These varieties are under restrictions until fruited and deemed worthy of further propagation. If found worthless for fruit, they may be of some ornamental value, or may serve as the starting point for something better in pear-breeding. The list of varieties sent out is as follows:

GROUP A.

Female parent Birch-leaved pear, *Pyrus betulifolia*

Male parent, Cultivated pear, *Pyrus communis*.

N. E. Hansen

1. *Pyrus betulifolia* X German pear pollen (label lost).
2. *Pyrus betulifolia* X German pear pollen.
3. *Pyrus betulifolia* X German pear pollen.

GROUP B.

Female parent, Cultivated pear, *Pyrus communis*;

Male parent, Birch-leaved pear, *Pyrus betulifolia*.

N. E. Hansen

4. Marie Louise X *Pyrus betulifolia* pollen.
5. Marie Louise X *Pyrus betulifolia* pollen.

6. Marie Louise X *Pyrus betulifolia* pollen.
7. Parrot X *Pyrus betulifolia* pollen.
8. Conference X *Pyrus betulifolia* pollen.
9. Parrot X *Pyrus betulifolia* pollen.
10. Parrot X *Pyrus betulifolia* pollen.
11. Marie Louise X *Pyrus betulifolia* pollen.
12. Marie Louise X *Pyrus betulifolia* pollen.
13. Parrot X *Pyrus betulifolia* pollen.

GROUP C.

Female parent, Chinese Sand pear, *Pyrus Sinensis*;
Male parent, Cultivated pear, *Pyrus communis*.

N. E. Hansen

14. *Pyrus Sinensis* X Russian No. 553 pollen.
15. *Pyrus Sinensis* X Russian No. 553 pollen.
16. *Pyrus Sinensis* X Louise Bonne de Jersey pollen.
17. *Pyrus Sinensis* X Russian No. 553 pollen.
18. *Pyrus Sinensis* X Russian No. 553 pollen.
19. *Pyrus Sinensis* X Russian No. 553 pollen.
20. *Pyrus Sinensis* X Russian No. 553 pollen.
21. *Pyrus Sinensis* X Russian No. 553 pollen.
22. *Pyrus Sinensis* X Marguerite Marillat pear pollen.
23. *Pyrus Sinensis* X Russian No. 553 pollen.
24. *Pyrus Sinensis* X Marguerite Marillat pollen.
25. *Pyrus Sinensis* X Louise Bonne de Jersey pollen.

GROUP D.

Female parent, Cultivated pear, *Pyrus communis*;
Male parent, Chinese Sand pear, *Pyrus Sinensis*.

N. E. Hansen

26. Parrot X *Pyrus Sinensis* pollen.
27. Louise Bonne de Jersey X *Pyrus Sinensis* pollen.
28. Koenig Karl von Wurttemberg X *Pyrus Sinensis* pollen.
29. Diel (Diel's Butterbirne) X *Pyrus Sinensis* pollen.
30. Russian No. 553 X *Pyrus Sinensis* pollen.
31. Fondante d' Automne X *Pyrus Sinensis* pollen.
32. Koenig Karl von Wurttemberg X *Pyrus Sinensis* pollen.
33. Koenig Karl von Wurttemberg X *Pyrus Sinensis* pollen.
34. Clapp Favorite X *Pyrus Sinensis* pollen.
35. Koenig Karl von Wurttemberg X *Pyrus Sinensis* pollen.
36. Conference X *Pyrus Sinensis* pollen.
37. Conference X *Pyrus Sinensis* pollen.
38. Geheimrat Dr. Thiel X *Pyrus Sinensis* pollen.
39. Louise Bonne de Jersey X *Pyrus Sinensis* pollen.

A FIELD METHOD OF HYBRIDIZING ALFALFA.

The work of introducing the Russian and Siberian varieties of alfalfa for the driest uplands of our western states is outlined in South Dakota Bulletin 141, Co-operative Tests of Alfalfa from Siberia and European Russia, January, 1913. The machine transplanting of one year old alfalfa plants which was first announced in this bulletin, has been carried on at this Station and at a number of places in the western part of the state. Close observation of this work shows that the blue-flowered alfalfa, *Medicago sativa*, and the yellow-flowered alfalfa, *Medicago falcata*, cross readily and that the resulting hybrids combine in large measure the good points of both. This hybrid is called Sand lucerne, *Medicago media*, in Europe, and is very abundant wherever the two species grow together in southern Europe or Asia. The hardiness of this resulting alfalfa will depend

on the region in which the parent plants are native, as noted in Bulletin 141. The Cossack Alfalfa found wild in the Voronezh province of Russia is an example of nature's work in this line. By combining these observations with my machine transplanting method the writer was lead to start a new line of work.

In the spring of 1914 one-year-old alfalfa plants of several varieties were set alternately by the machine transplanting method as illustrated. Several combinations were made. One of the two men sitting at the rear of the machine planted one kind of alfalfa roots, and the other man the other kind. In this way the two varieties were set alternately in rows. Later the seed from each variety was saved separately. The exact percentage of variegation will not be known until next fall, but the experience already mentioned indicates that a large percentage of plants with variegated flowers will result. A field of this kind may be started from a single plant if desired. In 1913 one plant was observed in our field of one variety of the yellow-flowered Siberian alfalfa, *Medicago falcata*, having a curved or falcate pod but with a blue flower like that of the blue-flowered alfalfa, *Medicago sativa*. The seed of this was saved separately and the plants bloomed this past season. The range of colors in these plants were remarkable, as it varied widely, scarcely any two alike, ranging from yellow to blue with many intervening colors. This variety has not been named.

It is quite evident that the maintenance of these Sand Lucernes or hybrid strains of alfalfa will be a matter of good faith on the part of the grower and seedsman, *since the color is not a means of identification*. In a way it is like the selling of northern or southern seed corn; you must depend mainly on the honesty of the grower and seedsman. This machine transplanting appears to be a quick method of crossing any two alfalfas you wish. The method is offered to alfalfa experimenters without any recommendations, but simply as indicated, a promising new line of work.