

The Agricultural Experiment Station

OF THE

Colorado Agricultural College.

A Hopperdozer

—BY—

P. K. BLINN

The Agricultural Experiment Station.

FORT COLLINS, COLORADO

THE STATE BOARD OF AGRICULTURE

| | TERM EXPIRES |
|-------------------------------------------------------------------------------------|-----------------------|
| HON. P. F. SHARP, <i>President</i> | Denver.....1907 |
| HON. HARLAN THOMAS | Denver.....1907 |
| HON. JAMES L. CHATFIELD..... | Gypsum.....1909 |
| HON. B. U. DYE..... | Rocky Ford.....1909 |
| HON. B. F. ROCKAFELLOW | Canon City.....1911 |
| HON. EUGENE H. GRUBB | Carbondale.....1911 |
| HON. A. A. EDWARDS..... | Fort Collins.....1913 |
| HON. R. W. CORWIN..... | Pueblo.....1913 |
| GOVERNOR JESSE F. McDONALD, PRESIDENT BARTON O. AYLESWORTH, } <i>ex-officio.</i> | |

A. M. HAWLEY, SECRETARY EDGAR AVERY TREASURER

EXECUTIVE COMMITTEE IN CHARGE

P. F. SHARP, CHAIRMAN. B. F. ROCKAFELLOW. A. A. EDWARDS

STATION STAFF

| | |
|-----------------------------------------------------|------------------------------------------|
| L. G. CARPENTER, M. S., <i>Director</i> | IRRIGATION ENGINEER |
| C. P. GILLETTE, M. S. | ENTOMOLOGIST |
| W. P. HEADDEN, A. M. PH. D. | CHEMIST |
| W. PADDOCK, M. S. | HORTICULTURIST |
| W. L. CARLYLE, M. S. | AGRICULTURIST |
| G. H. GLOVER, B. S., D. V. M. | VETERINARIAN |
| W. H. OLIN, M. S., | AGRONOMIST |
| R. E. TRIMBLE, B. S. | ASSISTANT IRRIGATION ENGINEER |
| F. C. ALFORD, M. S. | ASSISTANT CHEMIST |
| EARL DOUGLASS, M. S. | ASSISTANT CHEMIST |
| S. ARTHUR JOHNSON, M. S. | ASSISTANT ENTOMOLOGIST |
| B. O. LONGYEAR, B. S. | ASSISTANT HORTICULTURIST |
| J. A. McLEAN, A. B., B. S. A. | ANIMAL HUSBANDMAN |
| E. B. HOUSE, B. S. | ASSISTANT IRRIGATION ENGINEER |
| F. KNORR | ASSISTANT AGRICULTURIST |
| P. K. BLINN, B. S. | FIELD AGENT, ARKANSAS VALLEY, ROCKY FORD |
| WESTERN SLOPE FRUIT INVESTIGATIONS, GRAND JUNCTION: | |
| O. B. WHIPPLE, B. A. | FIELD HORTICULTURIST |
| ESTES P. TAYLOR, B. S. | FIELD ENTOMOLOGIST |

OFFICERS

| | |
|-----------------------------------------------|------------------------|
| PRESIDENT BARTON O. AYLESWORTH, A. M., LL. D. | |
| L. G. CARPENTER, M. S. | DIRECTOR |
| A. M. HAWLEY | SECRETARY |
| MARGARET MURRAY | STENOGRAPHER AND CLERK |

A HOPPERDOZER

BY P. K. BLINN

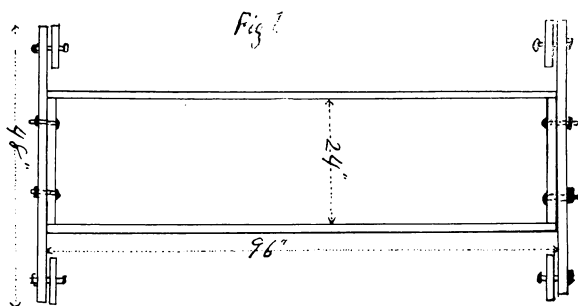
Our native grasshoppers have been a common pest in the alfalfa fields for many years, principally infesting the edges of the fields, along side of dry ditch banks, fences, or other dry land, such locations affording their favorite breeding places. For several years it seems that the "hoppers" have been rapidly increasing. Their injuries to the hay crops, alfalfa seed and honey yield of the state amount each year to many thousands of dollars, beside the serious injuries to beets, beans, potatoes, cantaloupes and most other crops that may be growing adjacent to the field of alfalfa to which they are attracted each time after the hay is cut.

The extent of their injuries the past season was unusually severe and quite general over the state. In the Arkansas Valley the alfalfa was almost stripped to stems in many fields, and the destruction of the bloom was so complete as to practically destroy the alfalfa seed crop east of Pueblo. The loss of the bloom also cut off the honey crop from one of the choicest honey producing sections of the United States, many of the apiarists being compelled to feed their bees during the summer months. Serious injuries were also made on nearly all other crops by the grasshoppers from the alfalfa fields. The farmers resorted to spraying, driving and poisonous baits, as well as other precautionary measures, but with only meagre results.

Having observed the shifting movements of the grasshoppers when the alfalfa is cut, it seemed evident that such a time offered a favorable opportunity to destroy the pest. It seemed that a hopperdozer could be used effectively behind the mower; accordingly a dozer was constructed on rather an inexpensive plan, one which any farmer with ordinary tools could make without the aid of a skilled mechanic.

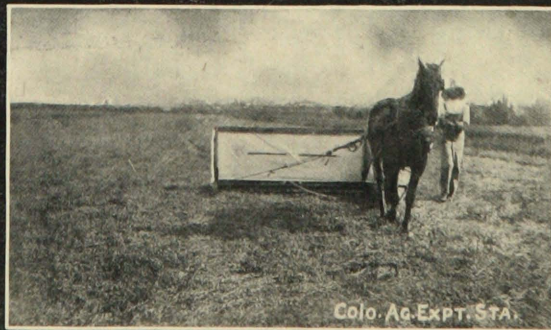
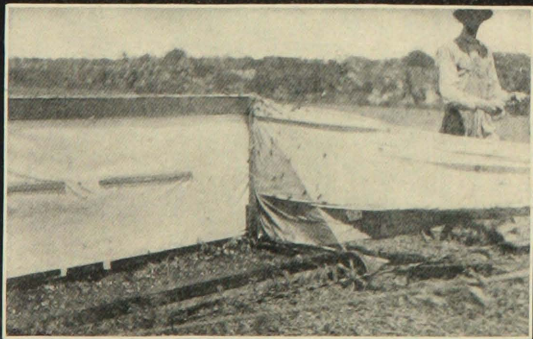
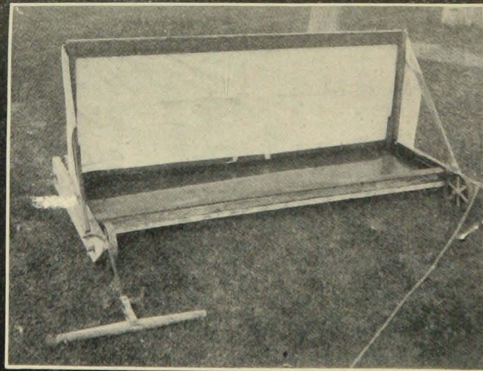
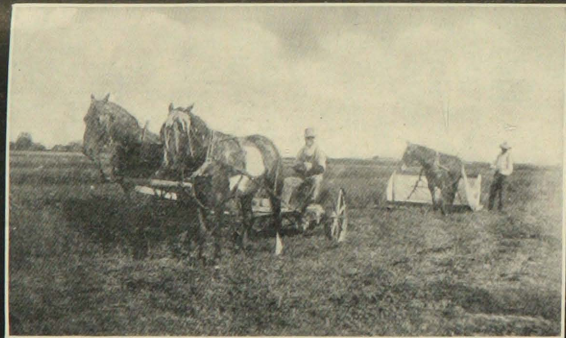
The bottom of the pan was a sheet of No. 24 galvanized iron 30x96 inches, the size of sheets usually carried by hardware dealers.

This bottom was nailed with common six-penny nails to a frame made of two-by-fours that was 24x96 inches in size and being the same in length as the sheet of iron, but about six inches narrower, which allowed about three inches to be turned up and nailed to the outside of the frame on each side. This made the pan more secure. To prevent leakage a strip of tow candle wicking was nailed beneath the iron between two rows of nails.



A coat of paint completed a water tight pan 24 inches wide inside by eight feet long. To the ends of this pan were bolted sled runners four feet long, cut from a piece of 2x10. The runners were so placed as to carry the pan about four inches above the ground. Fig. 1 shows the general plan of the pan with the runners attached, also four small 10 inch cast wheels bolted near the ends of the runners, also the dimensions as indicated. The wheels support the runners only one and a half inches and steady the pan over rough places. They lightened the draft and allowed the pan to be drawn over the hay without catching and dragging it. By hitching a horse in front of one runner with a short rope and with a longer rope from the other runner hitched into the hame staple of the harness, the wheels will carry the dozer at right angles and entirely to the side of the horse, thus preventing the hoppers from being frightened away from in front of the advancing pan. At the back of the pan is a light frame three feet high secured by uprights that are braced in front to the runners. Over this frame is stretched a sheet of white table oilcloth with the smooth side to the front. Every grasshopper that hits the smooth surface of the oil cloth screen falls into the pan which is filled with about two inches of water and about a pint of kerosene oil on the surface. The lower edge of the oilcloth is nailed with strips to the inside of the pan at the back to prevent slopping.

Plate I. shows the hopperdozer complete ready to hitch to and also views of it when in use and the manner of hitching.



Following the Mower
Near View, showing Pan

Hopperdozer
Manner of Hitching Horse

A HOPPERDOZER

The material and its cost to build the dozer at Rocky Ford was as follows:

| | |
|-------------------------------------------------------------|--------|
| One sheet of No. 24 galvanized iron, 23 lbs. at 9 cts. | \$2.07 |
| “ piece of 2x4, 16 ft. | |
| “ “ “ 2x4, 8 ft. | |
| “ “ “ 2x10, 8 ft. | |
| “ “ “ 1x4, 16 ft. | |
| Total 32 ft. at 2½ cents | 95c |
| 3 yards of table oilcloth at 18 cents | 54c |
| 4 cast wheels | 50c |
| Bolts, nails and rope | 40c |
| 1 bill candle wicking | 10c |
| Total cost | \$4.56 |

The hopperdozer was first tried on Mr. J. R. Roth's six acres of alfalfa east of Rocky Ford, the field being so infested that in the evening when the hoppers climbed to the top of alfalfa stems they gave a yellow cast to the otherwise green field. They had completely destroyed the alfalfa bloom and the adjoining fields of potatoes and beets, and cantalopes were threatened as soon as the alfalfa should be cut. After getting a start of several swaths with the mower, the dozer was started. The first round with the dozer the horse walked outside of the alfalfa while the dozer covered the first two swaths of the mower. The movements of the horse frightened the hoppers from the edge of the field into the pan or farther into the field to be caught at some succeeding round with the dozer. In the first two rounds, a half bushel measure of grasshoppers was skimmed from the pan; more water and oil were added, and the work continued to the center of the field, catching the hoppers more rapidly at each succeeding round. The last two swaths were so covered with hoppers that the mower was stopped and the dozer driven over this standing strip with the horse on a trot. The strip was about eight feet wide by seven hundred long, and once over and back on this strip, caught three heaping half bushels of grasshoppers. Many of the hoppers were down in the hay and after about fifteen minutes they had crawled to the top, and covered the strip again, and again the drive was made and two half bushels was the result.

The strip was left standing for several days and the dozer run over it several times each day catching many of the hoppers that remained on the field.

The dozer was run over the field several times the day it was mowed and between nine and ten bushels of grasshoppers were caught besides many that got out of the pan but died from the effect of the oil bath. A careful count of the number of grasshoppers

in a given measure was made and it indicated that over thirty thousand grasshoppers were killed in each bushel caught. A large part of them were very small hoppers and only a few, at that time, July 11th, had developed wings. Many alfalfa worms were caught when the dozer was run over standing alfalfa. The field has since been comparatively free from hoppers and no apparent injury was made on the adjoining crops.

About ten days later the dozer was used on the field of Mr. J. B. Fyan. The hoppers had then developed wings so that many were able to fly too far, thus preventing a very successful catch, although several bushels of grasshoppers were killed on about two acres of alfalfa. Other farmers used the dozer and several other dozers of similar construction were built and used in the vicinity of Rocky Ford. In fields where the grasshoppers were unusually numerous, satisfactory results were made, yet it was evident in the experience of all that the dozer could be most effectually used early while the hoppers were small and could not fly, and especially where the dozer was driven rapidly over standing alfalfa from 8 inches to 12 inches high; although it was demonstrated that large full grown grasshoppers could be caught and killed in the same manner early in the morning after a shower or heavy dew when the hoppers would be wet and numb from cold and too stupid to fly.

Early one morning in August, after an evening shower, the writer observed that a piece of alfalfa was literally yellow with grasshoppers that had climbed to the top of the stems to catch the warmth of the first rays of the morning sun. A horse was immediately hitched to the dozer, and coal oil not being handy the pan was filled with cold water only from a ditch near by and the horse driven at a trot through the standing hay which was about 12 inches high. It was 40 rods across the field and back and by that time the pan was full of grasshoppers struggling in the water. These were immediately skimmed out with a screen and thrown into a milk can and the cover put on. After the second trip the can was more than full of grasshoppers pressed in tight. As there was no oil on the grasshoppers the can was carried to the yard where a flock of young chickens and turkeys fairly covered the can after it had been turned on one side, with the cover off, and they had discovered what it contained. The following morning being wet and cold, we took an early start and in less than a half hour we had killed over four bushels of large grasshoppers on less than two acres; this time we used coal oil, as many hoppers seemed to escape when only water was used.

The amount of oil required, will not exceed a gallon to the

acre and usually much less. The oilcloth screen at the back of the dozer is an important feature as it does not allow the hopper to stick to it and those that hit it fall into the pan and are killed.

The wheels attached to the runners lighten the draft and enable one horse to pull the pan to one side as explained and shown in Plate I., and also allows the pan to be drawn through standing alfalfa without trickling it down to any extent. For larger fields a longer pan, say from 12 to 16 feet, would doubtless be more economical, but a long pan would need divisions to prevent the water from flowing to one end on steep ground.

A good example of the destruction of grasshopper eggs by early spring or winter discing of the alfalfa fields, was seen on the farm of Mr. C. J. Cover. His field was purple with bloom with comparatively few grasshoppers while all neighboring fields had been stripped of bloom by grasshoppers.