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Twelve of Idaho's Worst Weeds.

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By L. F. HENDERSON.

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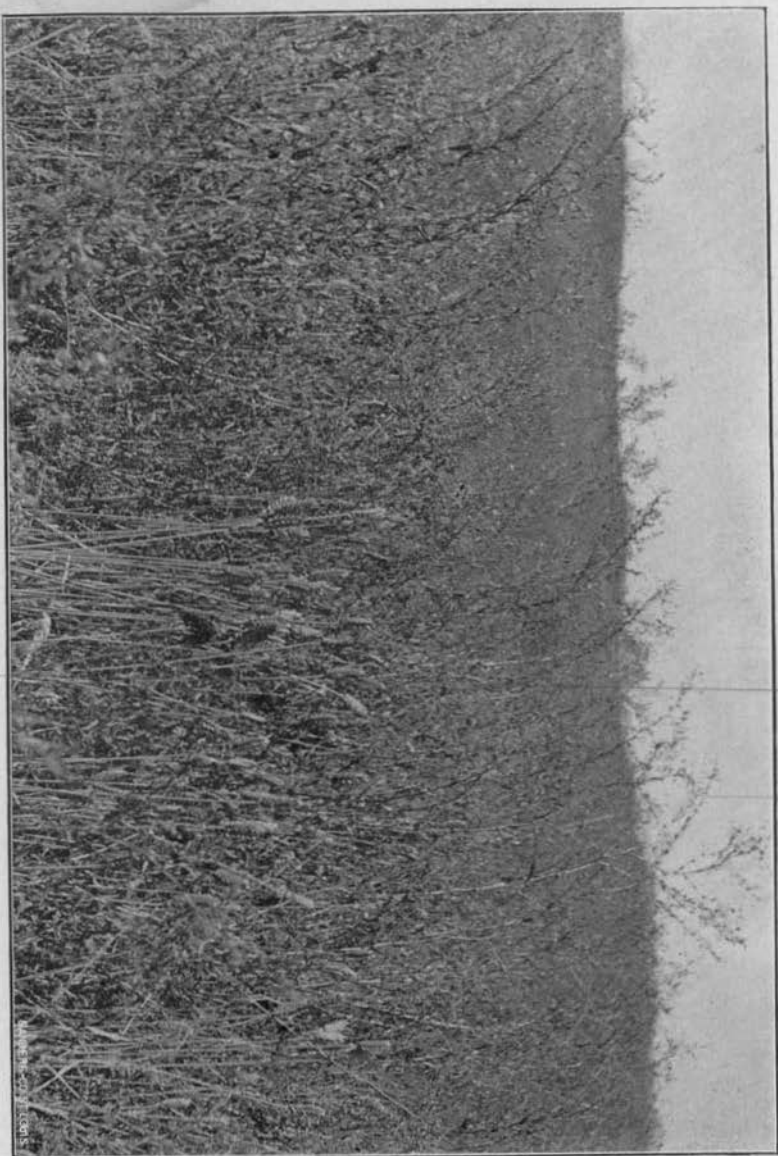
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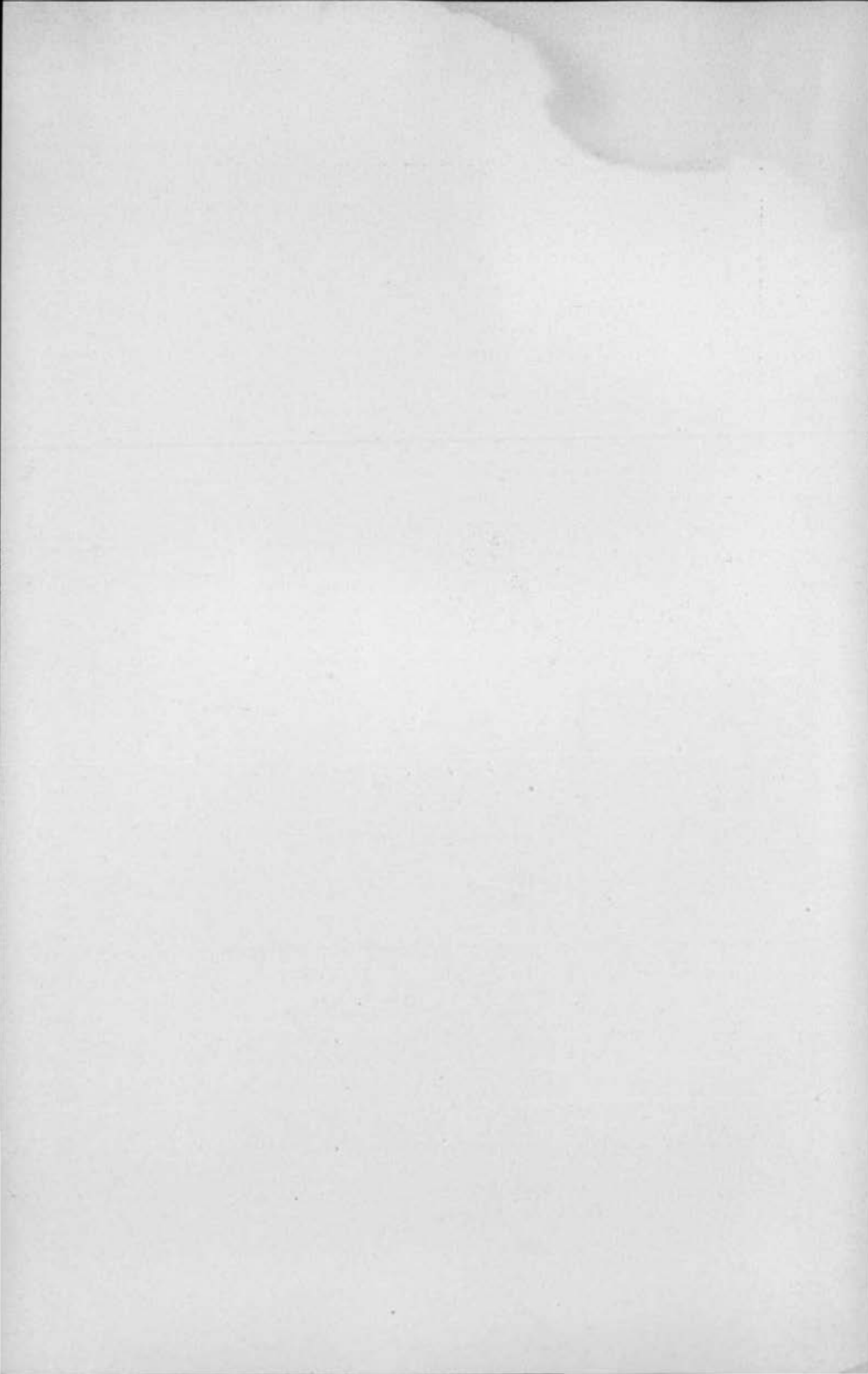
Bulletins issued since the close of the fiscal year, June 30, 1897:

11. Smuts and Rusts of Grain in Idaho, and the Most Approved Methods of Dealing With Them.
12. Sugar Beets in Idaho.
13. Meteorology.
14. Twelve of Idaho's Worst Weeds.

Plate I.



PRICKLY LETTUCE, WHICH HAS OVERRUN A WHEAT FIELD NEAR LEWISTON.



## Twelve of Idaho's Worst Weeds.

When one is about to discuss a subject by speech or by writing, he should carefully define that subject in order to know its limitations. When therefore we use the term "Weed" we should keep clearly in view what we mean by the word,—whether the generally accepted idea of a plant of no use to man, or the more restricted one of an uncultivated plant, or something wider than either of these and yet including them.

Webster defines weeds as follows: "Whatever plants grow among corn or grass, in hedges, or elsewhere, and which are of no use to man, injurious to crops, or unsightly or out of place, are denominated weeds." The definition is all-embracing and effective; it offers to us a wider horizon. It is not alone the plant injurious to crops, nor the one of no use to man, but likewise the plant which is under certain conditions "unsightly or out of place." To make this plain, let me instance a few examples, and show that no one part of this definition is equal to the whole. Carrots and parsnips, among the most useful of the cultivated plants, may easily become vicious weeds when allowed to escape from cultivation. The barnyard grass (*Panicum crus-galli*) is a great curse in many of the irrigated fields and orchards of Southern Idaho, yet in several places in the Snake River valley I have seen it under cultivation produce as heavy yields of hay and of as fine a quality as any other forage-crop. A mass of cornflowers is by no means an unsightly object in a pretty flower

garden, but how instantly they lose their charm when we see them scattered throughout a field of grain! They are simply "out of place." Said a farmer in one part of Camas Prairie, "Timothy is the worst weed we have, for it is always getting into every place it isn't wanted." What is more beautiful than a well kept rose bush; what is more "weed-like" than a great mass of thorny, unkept, half-wild roses filling up the front yard of an abandoned home!

And yet it is apparent to any one that were it not for the fact that certain weeds are "injurious to crops," not a bulletin would probably be issued from any of the stations of our land, for this is the part of our definition which is of paramount importance to the agriculturist. We cannot possibly take up all of our injurious weeds and treat them at any length in one bulletin. It will therefore be my aim to consider a few of them; which consideration will include a few prefatory remarks on weeds in general, short descriptions of our weeds accompanied by cuts and pictures, and the most approved methods of getting rid of them. More of our weeds will be considered in subsequent bulletins.

#### HOW DO WE GET OUR WEEDS, AND WHENCE?

Two great factors are at continuous work in the dissemination of seeds, first the natural, second the artificial or man's instrumentality, whether direct or indirect. Whilst the methods of dispersion of seeds by the former or natural means are almost numberless, and whilst the artificial are rather limited in number, it is doubtless a fact that in a large and comparatively well-settled country like the United States, with steam transportation in every direction, dispersion of weeds by the latter method far outstrips that by the former. This will be apparent as we proceed in the discussion of the two methods.

#### NATURAL METHODS OF DISPERSION.

Perhaps the most common means of dissemination under the natural method is to be found in the many wonderful devices for transportation exhibited by the seed itself. Under this head we

need mention only a few of such devices to make it clear how far-reaching dissemination by this method may be. Some seeds are provided with down (coma) which spreads out on the rupturing of the ripe pod, and acting as a tiny parachute, is capable of transporting the seed a distance of many miles. Put this distance at an extreme of ten miles, multiply this by the years in a century, and we can easily understand why such seeds are by nature wonderfully dispersed. Such are the seeds of the milk-weeds, willow-herbs, willows, and cottonwoods. On many other so-called seeds (akenes) the hairs (pappus) form just such means of conveyance. Of such are dandelions, thistles and that curse of Northern Idaho, the prickly lettuce. Other seeds and akenes are provided with specialized outgrowths from themselves or from their involucre which enable them to hang on to some animal, and thus be transported from place to place. Such might readily be called the "railroad tramps" of the vegetable kingdom. Amongst such we find the clothbur, the burdock, the carrot, and some of the buttercups. Amongst other genera it is the calyx itself that has the hooks. To such belong the horehound, fast becoming a pest in the Palouse country, and the burr weed (*Amsinckia intermedia*.)

Many seeds are readily dispersed to a limited distance by some contrivance in the seed-pod itself. The Mock Mistletoe (*Arceuthobium* sp.) has a tough rubber-like pod, which is distended somewhat as it matures by a collection of mucilaginous material about the seed. When this has reached such a point that the resistance due to cohesion is not equal to the inside pressure, the cap flies off and the seed is ejected several yards, possibly to strike some other branch and there find lodgment, to germinate the next year. In many of the pea family, notably in the genera *Lathyrus* and *Lupinus*, the two valves of the ripened pod twist up spirally as they open, and this so rapidly that the seeds are ejected as if from a boy's bean-shooter a distance of several yards. In the alfilerilla and cranesbill the seeds are lightly enclosed when ripe in the pods, to each of which is attached a spring (the style.) When the time comes for disposing of the seeds, the pod at the base of the spring loosens, flies up,

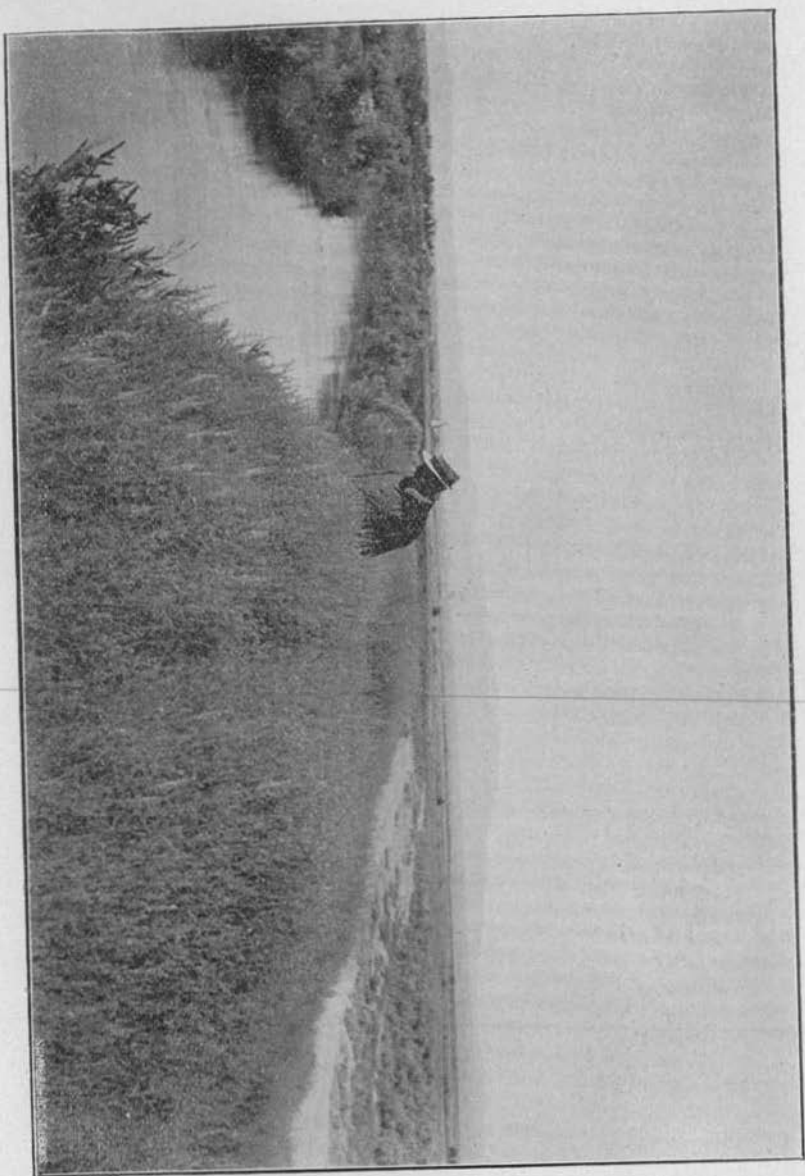
and by this means forcibly ejects the seeds through the opening on its face.

One of the surest and most rapid means of dispersion with some weeds is by the breaking off of the whole plant when the seeds are mature and then rolling along over the ground, driven along by the strong fall or winter winds and scattering its seeds far and wide. Such plants are known as "tumble-weeds." Good examples of these are the Russian thistle, fast spreading over the plains of Southern Idaho, and only held in check by the serviceable sage brush, the common tumble weed (*Amarantus albus*), the tickle grass, and the old witch grass. Many other plants are more or less tumble weeds, but to possess the attributes of a first class tumbler there are certain essentials.

First, the plant, at least the tumbling portion, must have more or less a spherical shape. Second, the branches must be quite stiff when dry, and sufficiently strong or else elastic, to ensure continued rolling. Third, it must break off readily either at the ground, as does the the Russian thistle and the common tumble weed, or just below the panicle, as it does in the two grasses above mentioned. The Russian thistle is said, on account of its tumbling qualities, size, and abundance, to fill up the fences, marking farm lines or especially erected to keep the thistle within bounds, and then having filled them up and furnished a good path, to be succeeded by myriads of others which roll over their cornered brethren and continue their unimpeded journey. I have myself seen the common tumble weed or the tumbling grasses roll for miles over open ground, to fill up as if with a hedge some obstructing fence, road or railway cut.

Many plants are slowly but surely dispersed by means of runners, creepers, rootstocks, or even roots. Thus the common brake or braken multiplies, just below the reach of plow, and only to be conquered by constant cultivation and consequent sapping the plants' life blood. I asked a man at the western base of the Cascade mountains what he called the yellow flowered plant known to botanists as *Thermopsis montana*. He told me that he never heard any name given it. "But," said he, "I call it shoe-strings. You see the root is so tough and long that it almost stops the plow. I often use it to tie up things with."





RESEAN THISTLE ON THE BANKS OF PHYLLIS DITCH, NEAR NAMPA.



Prof. Prentiss of Cornell University once made some interesting experiments with the roots of the Canada thistle. He cut up a long root into sections a quarter of an inch long, and on planting these pieces he found that the majority of them produced new plants by adventitious buds. The underground root stocks of the wire grass (*Juncus Balticus*) are often so long, strong, and matted in the alluvial bottom of the Palouse country as almost to stop a plow. These rootstalks branch and send up stems at almost every inch of their growth. One natural method of transportation, not however taken into account in the various adaptations of fruits or seeds for their dispersion, is that of water. Very few seeds seem to have any specialization for this mode of conveyance, and yet the distance traveled by currents of water may be greater in a season than any of those previously mentioned. It is rather remarkable however, as has been noted by many scientists, that very few of the seeds ordinarily transported by water are in any sense weeds. This statement would not of course apply to the seeds of the lowland weeds carried down stream by a vast volume of water due to unusual conditions. Perhaps the reason for this may be found in the selective characters, adapted to this means of dispersion, being of too uncertain a nature to permit of their becoming fixed. With this might be mentioned the great dispersive agency found occasionally in birds of long flight. Perhaps no agency we have any knowledge of can accomplish this in so short a time, but it is too uncertain to amount to very much. And yet under no other hypothesis can the dissemination of some seeds be accounted for. A small grass is now found growing quite abundantly in the moist or wet meadows of Sauvie's Island, at the confluence of the Willamette and Columbia rivers in Oregon, and in past years often collected by the writer. This little plant is known to botanists as *Coleanthus subtilis*, Sied., and is a native of Norway and other countries in northern Europe. As I remember, it was the opinion of both Dr. Vasey and Dr. Gray that this plant was introduced into Oregon on the feet of geese. Its limited habitat in America would warrant rather this direction of emigration than the opposite.

## WEED DISPERSION THROUGH MAN, OR THE ARTIFICIAL METHODS.

Though much more limited in number of means of transportation compared with nature's methods, the direct and indirect dissemination of seeds by man's instrumentalities are much more effective. Of all these perhaps the most certain and immediate is the sending of impure seed from place to place. This is the way that most of the pernicious weeds came from Europe, and we may add right here that most of them came from that country, either primarily or from previous introduction into Europe from Asia and Africa. Of course this does not include all, for many find their way into the United States in earth or stones used as ballast, or in hay used as packing for china and such like wares. Perhaps the most noteworthy recent importation of this kind is the Russian thistle, to which special consideration will be given further on in this article. We have very stringent laws to prevent smuggling, but none to prevent the introduction of impure seeds; and yet I have no doubt, if the damage done crops by weeds received in this way from foreign countries could be set off against all that might have been done had there been no such vigilance against smuggling, that the balance on the ledger in the matter of loss would be found on the weed side. Let us instance but those two pests received within the last few decades, the Russian thistle and the prickly lettuce. It would be interesting reading if some one capable of the work would give us estimates of the damage done by these two pests, and the amount of money it would require to eradicate them at the present time. It is likely that the two sums would mount up into the billions. Such a law of inspection would of course be almost useless now, for with most of the worst European weeds already here, and the different transportation companies indirectly aiding in the scattering of these, the direct benefit to be gained from the non-introduction of other weeds would not probably equal the loss caused by extra taxation. The only remedy, as it seems to the writer, is for the states to legislate against certain weeds, or where the state treasury of some of the newer states would be bankrupted by such a necessary outlay, the general government should step in and do the work. How much would

have been saved in actual expense to the different state governments, and to the citizens of the United States, had this plan been adopted with the Russian thistle, a plant which was too firmly entrenched in our land when discovered to be extirpated by the government of one state. Of course the general government should be expected to intervene only when such an emergency as this might arise, *provided*, every state have adequate laws and police regulations of its own to combat such pests when they first gain footing in that state.

A large part of the trouble coming from dispersion of weed-seeds in the seeds of grasses, clovers and other cultivated plants is to be laid directly to the doors of irresponsible sellers in the United States. Not only is requisite care not taken by some of those, but the evidence is conclusive that they connive in or at times practice adulteration of clover and grass-seed with the seeds of pestiferous weeds.

A second great means of artificial dispersion is the railroad, and to a less extent the steamboat lines. This is impossible to avoid altogether, though it is doubtless the case that sufficient care is not taken to keep the yards, depot grounds, and rights-of-way free from weeds. And yet railroads are in many localities as careful as the farmers or officers of counties and states through or in which their lines are operated. In many cases they are more so. However, with a little more care and supervision many of the worst weeds would be kept out of new localities,—a thing which would undoubtedly in time inure as much to the benefit of the railroads as to the residents along the line. What injures the productiveness of the farm must of necessity detract from the freight transportation of the roads. The scattering of weed-seeds along railway lines is accomplished in many ways, such as the cleaning out of offal from cattle cars, the rattling out of seeds of grains and weeds from more or less empty freight cars, the throwing off of baled hay to be used by construction camps, mills, and stock men at out-of-the-way places, and the sweepings of cars at freight yards and depots. This, and nothing else, can account for the recent entry of the Russian thistle and tumbling mustard into Southern Idaho, and

their rapid extension all along the road of the Oregon Short Line.

#### IS A STATE WEED LAW NEEDED?

As to the necessity of a state weed law, no one can have the slightest doubt of it, if he has studied the matter even in the most indifferent way. The only men I have seen opposed to a weed law in some form are those whose fields are pretty badly infested already, or those who have no interest in agriculture at all, such as the more *ignorant* of the stock men, mill men or miners. I have italicized the word ignorant, for I cannot conceive that any but this class could be opposed to a conservative law in this direction. The benefits to be derived from such a law, and the justice arising from its enforcement are too patent to suffer much discussion. As there may be some, however, who are honestly opposed to such a law, I shall try to sum up a few of the most obvious benefits arising under a weed law well conceived and fearlessly executed. And here we may just as well remark, that inasmuch as the constitution of our state forbids the creation of other county officers, save by constitutional amendments, it falls to the legislature of the state to see that such a law is passed and the appropriations made therefor. "But," we shall imagine our honest objector remarking, "do you expect to legislate all the weeds out of the state? If that is the case, you will soon bankrupt us by taxation to enable such a plan of campaign to be carried out." I would answer, by no means. All the revenue that could be raised on all of the taxable property in the state could not do this. It is doubtful whether all of the state's revenue would effectively take out the prickly lettuce, so common is it today in our state. On the other hand had there been some law in the land relating to noxious weeds when it first made its appearance, a very small sum might have kept in check. That is the substance and strength of any weed law in a state as sparsely settled as Idaho: keep it out if you can, but kill it out when it first appears, should be your motto. As a good example of the injury to a state with no weed law at all, let me instance a few cases in Idaho. About four years ago the Russian

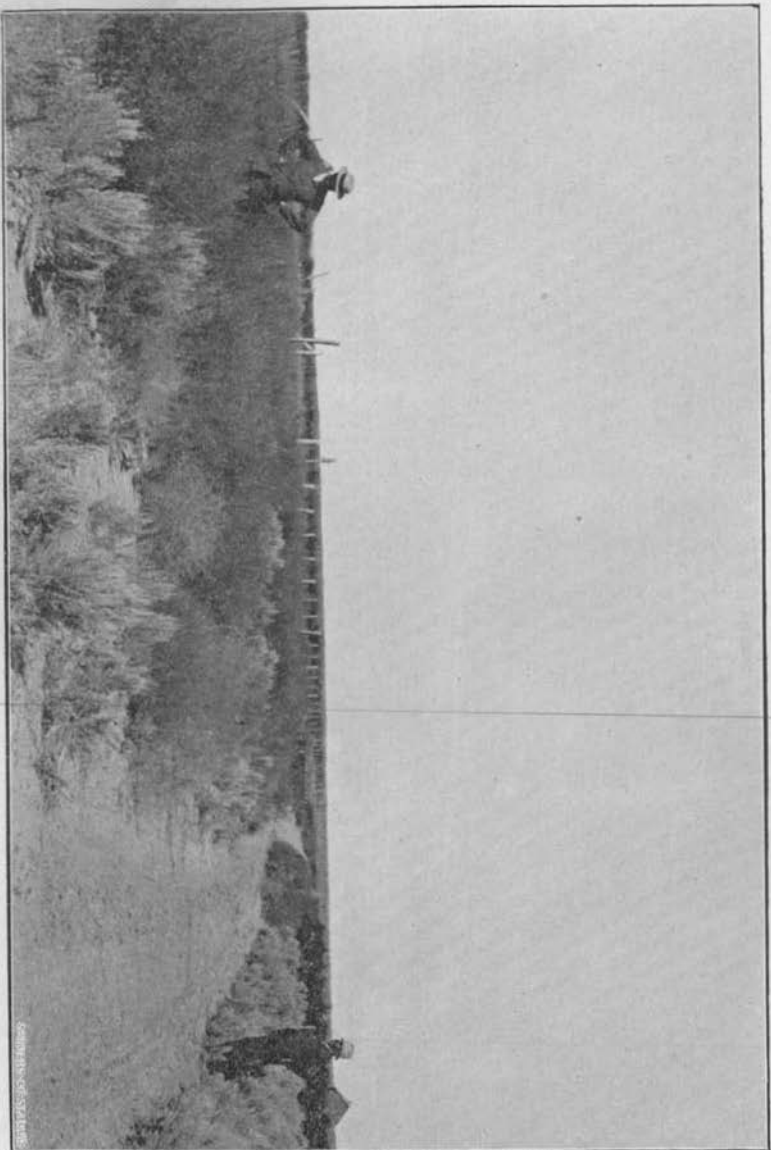
thistle was first noted near Nampa along the Phyllis ditch by Mr. Robt. Milliken. He called attention publicly to the fact of its presence, and urged its extirpation. A few dollars, perhaps not even one dollar, expended then, might have prevented its spread in the state, at least at that time. The same vigilance and a few dollars' expenditure would have kept it down at all future times. We have no weed law, and the result was, there being no person especially delegated to look out for such things, that nobody looked after it, and today it would take several thousand dollars to destroy it. This could yet be done had we a law allowing it, and even this expense would be justifiable when we look ahead and see what its dissemination through the state will mean, judging from the experience of neighboring states. About three years ago the first specimens of the tumbling mustard (*Sisymbrium altissimum*) made their way into Idaho. A few dollars expenditure wherever it appeared would have kept it down. Now it is found in a limited degree from Salmon to Boise and even Weiser. At places near the railroad, such as Nampa, Mountain Home and other towns, it is already an unmitigated pest. A more recent addition to the most pestiferous weeds is the Canada thistle. This has been found to my own knowledge in but three small patches within the borders of the state, one in the city of Boise, one just below the city, and one in the small town of Sand Point on the N. P. R. R. at Lake Pend d' Oreille. A few dollars expended when this pest was first noticed two years ago would have temporarily eradicated it in the state, as far as known. Probably \$100 would do it today. There being no law, however, to compel its being done, they simply go on their insidious way, slowly but surely spreading themselves over the state. Even the city officers at Boise seem indifferent to the matter, for I have been assured by citizens of that place that the authorities have been several times warned of its presence. I took pains to speak of it to the town marshal at Sand Point, but he met my enthusiastic recital of its vicious nature with the remark: "Why, them's pretty flowers! I like to see 'em grow."

The second great consideration in judging whether a weed law is a necessity is the matter of justice to all residents in the state. Suppose two ranches were contiguous, the one owned, we

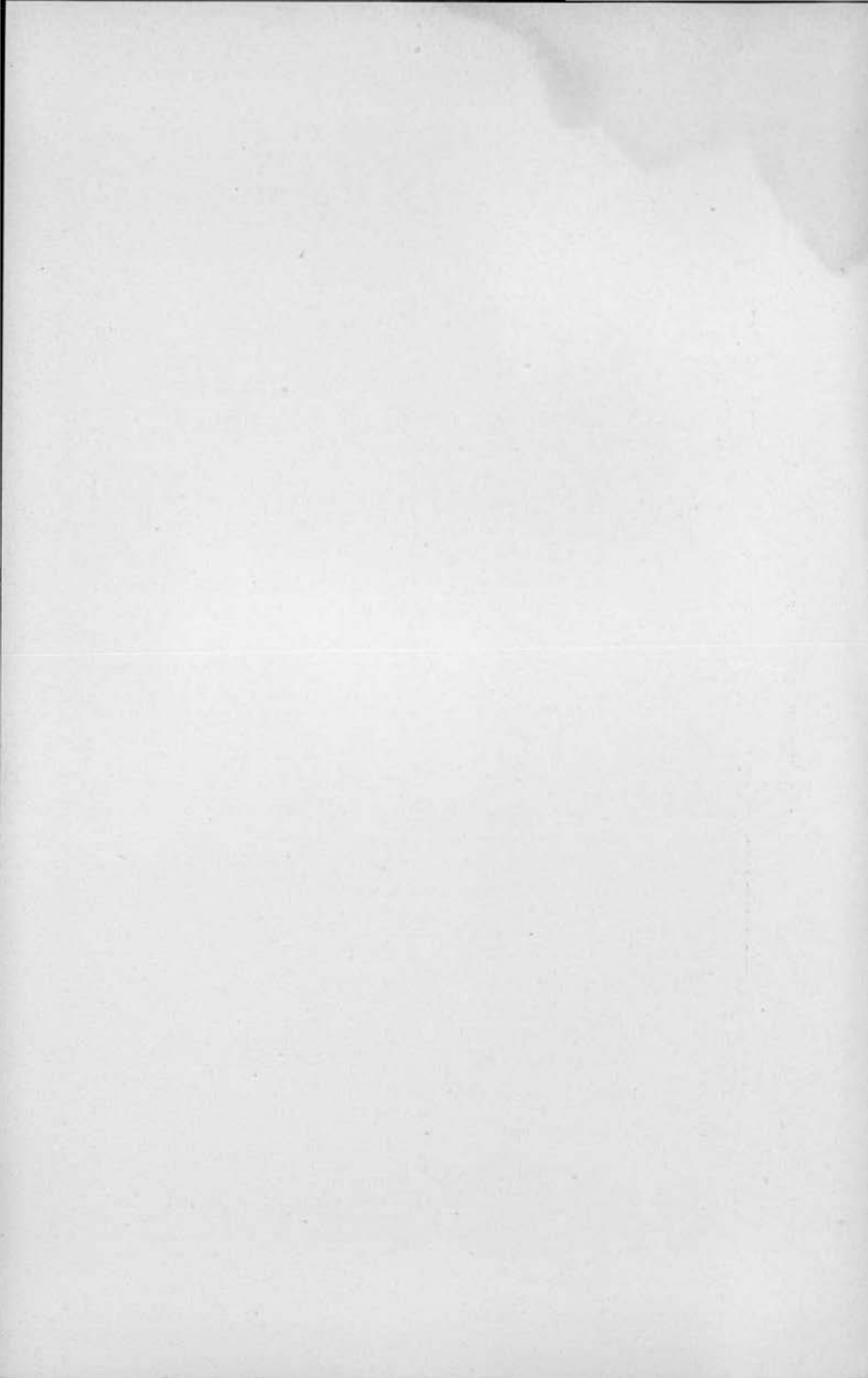
will say, by A, the other by B. Suppose A kept herds of cattle, while B raised quantities of grain and hay; suppose further that A deliberately went up to B's fences, pulled them down, and let in all his cattle; suppose when detected and accused of his wrong-doing he would reply: "Why, B's hay and grain are nothing to me; let him look out for my cattle when they are driven in, and drive them back again,—or better let him move somewhere else if he dosen't like it;"—how long does any one suppose it would take the angry neighbors to pull A's house down about his ears? And yet the same thing is going on daily, if we change cattle into weeds, and but a feeble remonstrance is heard from time to time. While attending one of the meetings of the Horticultural Society at Boise I was deeply moved by the quiet complaint poured into my ears by one unfortunate farmer. Said he, "I have always made it a point, wherever I have lived, to fight the weeds on my own ranch, and most of my neighbors did the same. This is the first state, however, that ever I lived in where fighting weeds seems no use, and that is because we have no weed law. I have a mighty nice little place"—mentioning his locality, not far from Boise,—“and have taken lots of pride in it. Except for the last two years I have been able to keep out the weeds; but my neighbor, who lives just west of me, never apparently pays any attention to them, so his place is as foul as it can be, and every wind brings the seeds over into my place, especially the prickly lettuce. Now it keeps me fighting weeds all summer long, and I don't get time for anything else. I am afraid I'll have to move somewhere else and just abandon my home here. It's too bad, Sir, for a nicer place I don't want to see!" Now, can any one deny the injustice that allows this neighbor to put what amounts to a mortgage on this man's land without giving our complainant any thing of value in return? Although the prickly lettuce, as I have said before, cannot be eradicated in Idaho without the expenditure of vast and unwarrantable sums of money, it, as well as other very bad weeds, can and should be kept down in thickly-settled agricultural communities, no matter if it do cost each land owner something in time and money to bring about such a state of affairs. We owe it to our industrious neighbors and to our posterity. A signal



Plate III.



TUMBLING MUSTARD, NEAR NAMPÁ.



case of this injustice came under my own observation a couple of years ago. On the highroad between Lewiston and Craig Mountains were two fine fields, both in flax. They looked as though each covered a section of land. The one on the right hand side was so badly infested with False Flax (*Camelina sativa*) that it promised not more than a third of a crop. The crop on the left hand side was, as far as the writer could observe, absolutely free from the false flax. Yet it could not be more than a year at most before the tremendous crop of weed seed on one side of that road would be more or less dispersed over the farm on the other side, and both crops in a few years be in an equal state of foulness. I ask whether morally or legally, except for the absence of weed law in the state, that man to the right of the road should have been allowed to let his pernicious crop go to seed, to the detriment of thousands of magnificent acres of cereals and flax? That man should have been compelled to cut down that crop of beweeded flax before the interloper could ripen its seeds, and if such an act would have bankrupted him, the county or state should have paid him something for his sacrifice.

I shall now proceed to the consideration of twelve of Idaho's worst weeds. In saying they are the worst, I would not have anyone judge that all of them are very prevalent in the state. Some few are comparatively rare as yet, but they are placed with those much more widely dispersed, and to the exclusion of many others which are much more prevalent, for the reason that they are known to be pests in other states of the Union. Therefore the elements of noxiousness and abundance are given equal weight in this article.

## WILD OATS.

(Avena fatua.)

Perhaps the most serious weed at present in Idaho is the Wild Oat. This is due to the fact of its being most frequent in the grain fields of the northern counties,—places from which it cannot be removed by cultivation as other weeds can that abound



Fig. 1.

most in orchards and gardens. It hails from Southern Europe where it has been known for centuries. It is difficult to put an exact estimate upon the loss occasioned by this plant to growers of wheat and oats in the entire Palouse country, but it is per-

fectly safe to say it amounts to one million dollars annually. That I have not exaggerated the loss done by this pest can be easily seen, when the amount of shrinkage is observed in the wheat credited to a man after it has gone through the cleaning process at most of our warehouses and mills. While this is ordinarily from 2 to 5 per cent, I was credibly informed at Juliaetta, that from a few districts of the fine Potlatch wheat belt the shrinkage at the warehouse was 25 per cent! On the other hand, many fields show almost pure wheat; so that any such average as 25 per cent at the warehouse would of course be absurdly disproportionate. It varies between two and six per cent. I think it perfectly safe, from what I can learn from elevator men and from my own observation to put the per cent loss from wild oats, considering not only the actual amount of oats in threshed wheat, but also what had dropped previous to the threshing, (always the large amount,) and to the extra space occupied by the growing oats, due to its spreading nature, as high as 20 per cent for spring wheat. Putting the yield of the entire Palouse country at 14,000,000 bushels, 20 per cent will give nearly 3,000,000 bushels, of which probably two thirds is spring wheat. This at 60 cts. will give us about \$1,200,000 loss. If this is a fair estimate of the shrinkage in the yield of wheat due to this cause, it behooves the farmers of the Palouse country to adopt every means within their power to rid themselves of the wild oats as far as possible. That riddance from this curse can never be a complete one, no one believes for an instant; but that the farm shall be overrun by them is a serious fault, and one that can in great measure be remedied.

#### DESCRIPTION.

Annual, 1-4 feet high, erect or spreading, simple or branching from the base, with branches and spikelets drooping, lighter colored when ripe, generally taller than the cultivated oat or than wheat, and shedding its seeds (florets) before either of the latter are ripe. Sheaths of the leaves generally hairy at the summit, often smooth, while the first and second florets bear long, twisted awns, bent near the middle. The floral glume enclosing

the grain is at times smooth like the cultivated oat (var. *glabrescens*,) but oftener hairy below the middle, nearly black at maturity, narrower and longer than the cultivated kinds.

#### ERADICATION.

This, as has been already hinted, is by no means an easy matter in a country where the wild oat is as much at home as it is in Idaho, especially the northern counties. It is too abundant to think of eradicating it in the fields of growing wheat and oats by pulling it up. Any means here must be preventive rather than curative. The most successful method of treatment seems to be to summer-fallow a part of the farm each year. If the fallow be plowed rather early it is best to turn in cattle in the fall, to destroy any oats that may have sprung up or that escaped complete turning under. If the ground is plowed late, it is well to turn in cattle before summer-fallowing, as otherwise the wild oats might go to seed before the fall plowing is done. Some let the land lie a whole season without any summer-fallow, but this is a bad plan where other weeds are thick, even if cattle keep down all of the oats. I have in mind a field near Moscow that was so treated, and though the wild oats were suppressed, so abundant a crop of tumble weed (*Amarantus albus*) was raised that I doubt whether the rest to the land and the destruction of the oats was not more than counterbalanced by the vast crop of weeds. Where one cannot afford to let a large part of his farm lie idle, or imagines he cannot, he must cut the crop of oats or wheat for hay early in the year, and before the wild oats ripen, or better raise some crop upon the land that can be cultivated with the hoe and cultivator, or, if this is not profitable, raise an early variety of winter rye or barley. Even with all these crops, save those of a nature to need the cultivator and hoe, cattle should be pastured upon the land as soon as the hay or early grains are cut. Otherwise the stools of wild oats will send up vigorous shoots from the base, and a good crop of the oats ripen their seeds before the severe frosts of winter can put an end to them. That hay raising and rota-

tion of crops are the best methods of eradication is fully vouch-  
ed for by the fact that the eastern states are hardly at all  
troubled by the wild oats, and yet it came there from Europe  
before it came west. It is even serviceable in a grazing coun-  
try.

A gentleman in Latah county who has had much experience  
in raising wheat treats his land as follows: About every third  
year, instead of summer fallowing, he sows one bushel of wheat  
to every acre about the first of June or last of May. This kind  
of wheat should be of a kind to stool widely, so as to cover as  
much of the surface of the earth as possible. When this comes  
up together with the wild oats in the soil, he turns on as many  
head of stock as the field will keep in good condition. These  
come out in the fall as splendid beef cattle, while at the same  
time, by their eating and trampling, they have completely kept  
the wild oats from seeding. In the fall he plows up the whole  
field, the remnants of the wheat and wild oats are turned under  
as green manure, and a heavy seeding of wheat follows. In this  
way his wheat is almost absolutely free from the oats, while the  
yield is so much greater for the manuring and rest of the land  
that in the two years he raises as much wheat per acre as he  
would have raised in three without the rest, to say nothing of  
the eradication of the wild oats. The plan of another practical  
farmer, which he asserts will clean any field, no matter how badly  
seeded with wild oats, is as follows: Just before the badly infested  
field begins to ripen its oats he cuts it for hay to prevent reseed-  
ing. In the fall he plows thoroughly and puts in his grain,  
planting heavily. The wheat grows during part of the winter  
when the oats have died out. In the spring the latter come up  
thickly from old seed, but the growth of the wheat is so much  
stronger that it soon tends to crowd out the oats. Should the  
spring be at all dry, which conditions will retard the growth of  
the wheat if not kill it out in spots while it will in no wise  
retard the growth of the oats, he twice harrows the field in op-  
posite directions. This is beneficial to the wheat in two ways,  
first by pulling up many of the young oat plants, second, by  
loosening the soil and filling in the cracks in the baked

surface, thus giving the wheat a fine mulch of loose earth, preventing evaporation, and stimulating the growth of the crop.

PRICKLY LETTUCE, COMPASS WEED.

(*Lactuca Scariola*, L.)

This plant is often, nay generally known as the "Chinese Lettuce," reflecting probably the too prevalent idea that all of

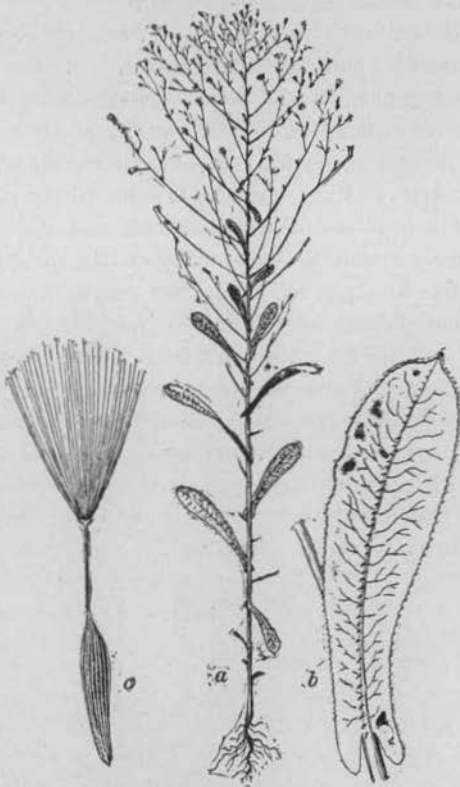


Fig. 2.

the ills on the Pacific Coast come from China and the Chinese, and that everything that comes from China must be bad! Like



nearly all of our worst weeds this is likewise a native of Europe. How long this plant may have lived unnoticed in America is not known, but certain it is, and that remarkable when we consider its prevalence throughout the United States at present, that it was not officially noticed till the year 1868, when Dr. Gray mentioned it as growing in waste places about Cambridge, Mass. Ten years after it had reached the states of Ohio, Illinois and Indiana, and now, only 30 years after, it is probably to be found to a greater or less extent in every state in the Union. In Idaho, as well as along the entire Pacific Slope, it is a serious menace to agriculture. It seems to be as bad in the irrigated lands of Southern Idaho as it is in the Pan-Handle. While in the south it seems most obnoxious in gardens, orchards, and yards, in the northern part of the state it is becoming only too well established in the wheat and oat fields. I have seen this weed so bad in some of the sandy-loam wheat fields about Lewiston that what little grain grew was almost hidden. I even heard one farmer say it was a matter of consideration with him whether he would cut his fields at all that year, the estimated amount of wheat not being of sufficient value to pay for the harvesting. Some method of successfully combatting this weed must be inaugurated, or the Palouse country, from becoming one of the best producers of wheat, will become one of the poorest. Though the wild oat is a bad weed, and though its malign star is now in the ascendant, I look for the time, and that not far distant, when the prickly lettuce must be rooted out on the farms or it will render them comparatively worthless.

#### DESCRIPTION.

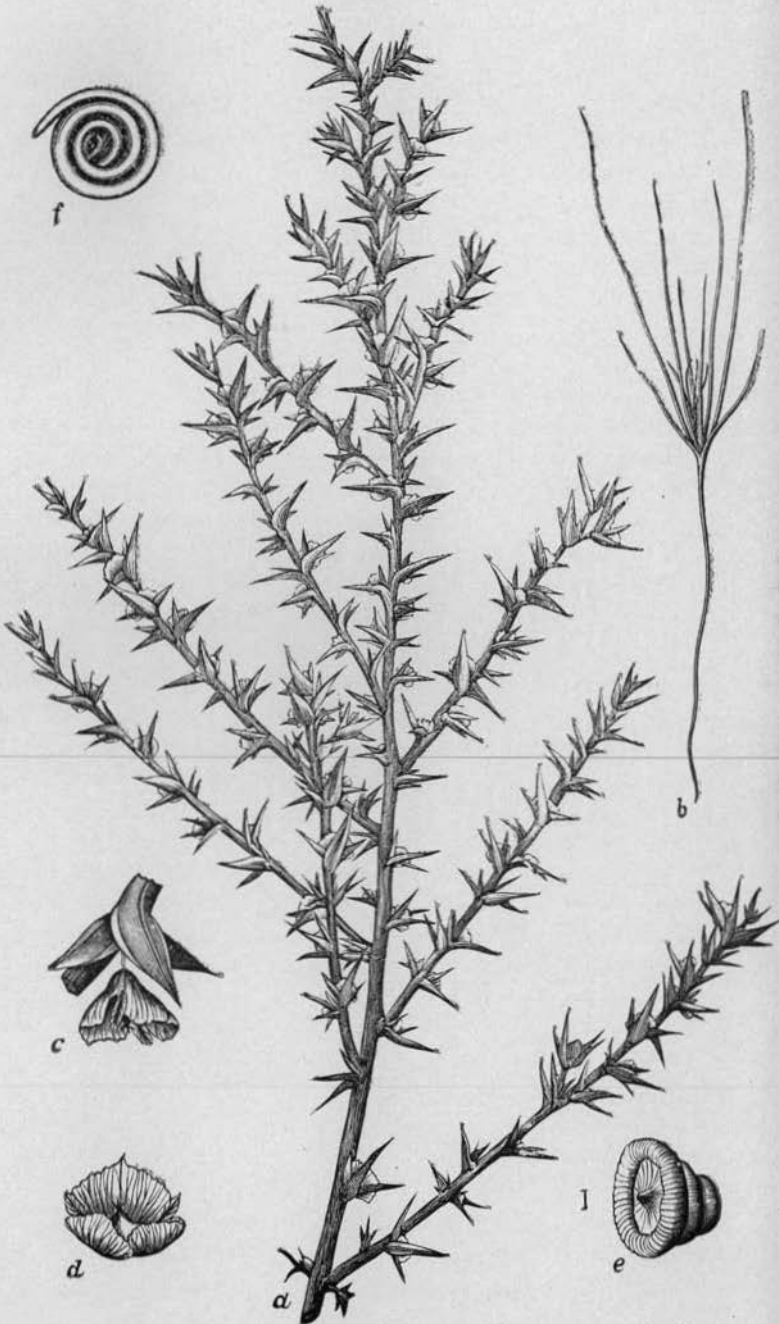
An annual, or occasionally almost a biennial, with smooth or prickly stem rising from 1 to 6 feet in height, branching liberally, and bearing quantities of small yellow "flowers" (heads). The leaves are oblong, with clasping-lobed bases, and very prickly on backs and margins, receiving a 90 degree twist soon after their departure from the stem so that they have the edge of the blade pointing up and down, also north and south; the brown, ribbed, somewhat wedge shaped  $\frac{1}{2}$  of an inch long seeds (akenes)

are each provided with a hair like parachute, by means of which they are easily carried from field to field. A single plant, according to Mr. Dewey of the Department, has been known to produce 8,000 good seeds. The plant has a milky juice, in this respect as in others resembling the cultivated lettuce.

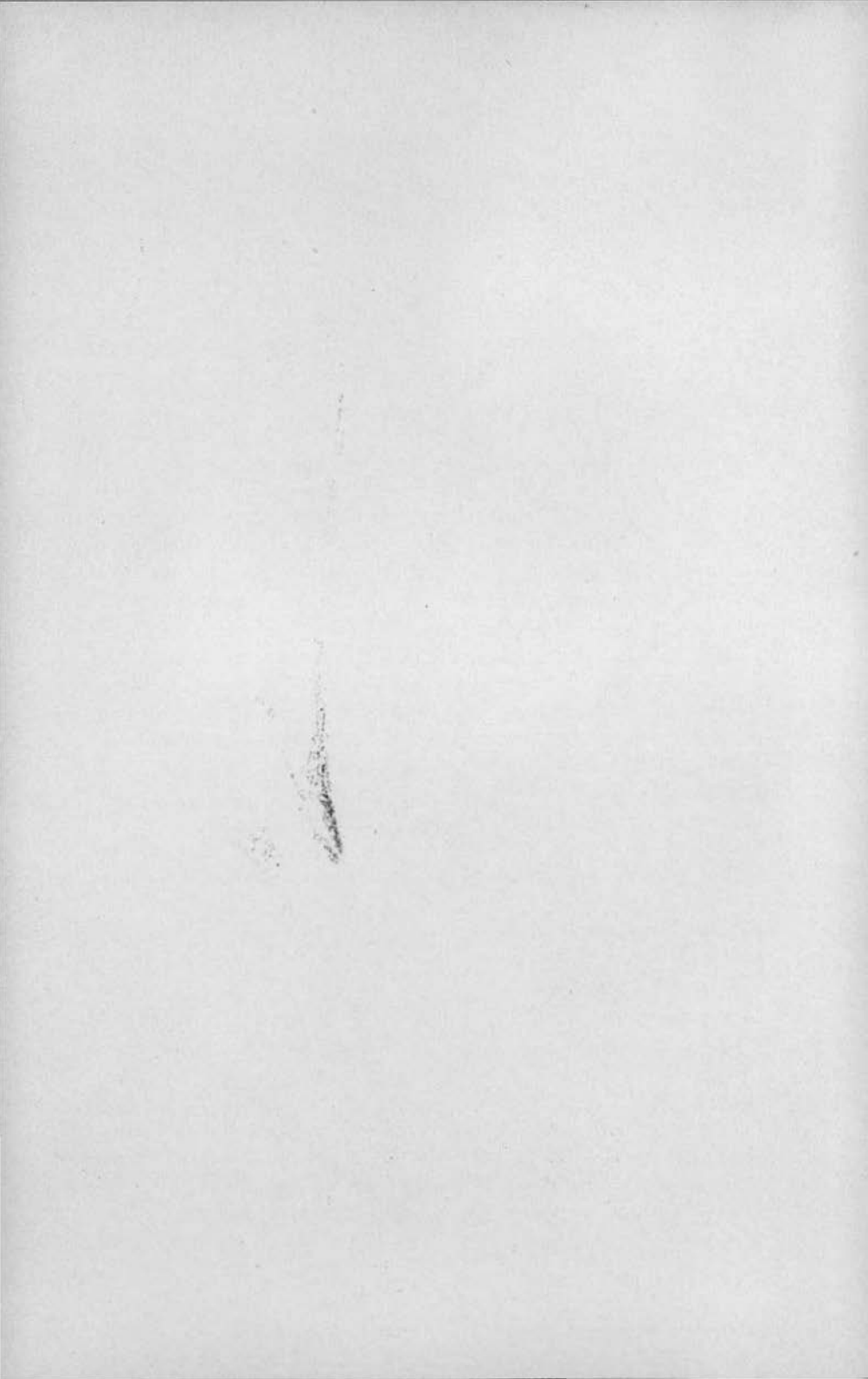
#### ERADICATION.

The eradication of this weed in cultivated land is one of the most serious problems the farmers of the Palouse country have to face. On account of its long, tough tap-root it is impossible to pull it up by machinery and almost so by hand. Cutting it down, at least in Northern Idaho, seems to avail little, as it immediately puts out a quantity of shoots from near the base, and these all fertile, which keep well towards the earth as if to escape the persecution of the knife. A few days suffice for these shoots to pass into the flowering state, then into the fruiting, and then for the seeds to be scattered far and wide by the first good wind. They will grow in almost any soil and through all the summer and fall. There is almost no use of any *one* man starting in to combat this pest; there must be concert of action, voluntary or compulsory. Luckily cattle, horses, and especially sheep eat it readily when other food is scarce, and this fact may be turned to account when a place is badly infested. A small band of sheep on each farm where summer fallow is practiced will render a good account of themselves in reducing the lettuce on such a pasture. Cultivation with hoed crops is by all means the best method of eradication, where such crops are profitable. At present they are not to any great extent in Idaho, a state of affairs which will probably end when population is denser, fields more divided up, and consequently more diversified agriculture shall obtain and more live-stock be raised than is at present practiced or practicable. In gardens and lawns the plants can and should be pulled up, or cut down with the hoe below the crown, and not one allowed to come to seed. Either of these latter methods is absolutely valueless, if any of the seeds have reached maturity; it simply

Plate IV.



RUSSIAN THISTLE.



dries them out and scatters them together, instead of a few at a time.

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## RUSSIAN THISTLE.

(*Salsola Kali* tragus. (L) Moq.)

This plant is not a thistle at all in the true sense of the word, but the appellation, derived from the two facts of its Russian home and its prickly nature, is too well fixed to allow of a change. The plant belongs to the goosefoot family or Chenopodiaceae, and has for near relations the common pig-weed (*Chenopodium album*) and the Jerusalem Oak (*C. Botrys*) amongst the common weeds of Idaho, while amongst the cultivated plants it has the beet and spinach. Perhaps the name "Russian Tumble weed," would be the most appropriate one for this plant, for it is to this very effective method it possesses of scattering its seeds by tumbling along over the ground that it owes most of its viciousness as a weed. An admirable bulletin from the pen of Mr. L. H. Dewey of the Agricultural Department at Washington gives so good a history of this weed, present and past, that it is a pity that it cannot be in the hands of every farmer in the United States in whose neighborhood the plant occurs. As many, if not most, of my readers, may not have seen this bulletin (No. 15, Division of Botany) I shall be pardoned for quoting that part in full that tells of its history. "Nearly a century and a half ago," says Mr. Dewey, "this plant was mentioned by Linnaeus as growing in Eastern Europe, and many botanical writers have since described it among the plants of that region. The species *Salsola Kali*, or some of its varieties, is found in most of the provinces of Eastern Russia and Western Siberia. The variety *tragus* seems to have developed on the plains of Southeastern Russia, where the conditions are very similar to those of the great Plains region of the United States. For many years it has been a destructive weed in the barley, wheat, and flax regions of Southeastern Russia, and the cultiva-

tion of crops has been abandoned over large areas in some of the provinces near the Caspian Sea. No effectual methods of exterminating the weed are known in Russia. Sheep, pasturing on the young plants aid materially in keeping the thistle in check, but it is continually growing more troublesome and extending to new territory.

"The plant was first introduced into the United States in 1873 or 1874 in flax seed brought from Russia and sown near Scotland, Bonhomme County, South Dakota. The land there is somewhat hilly, and corn is the chief crop raised, so that, owing to the wooded ravines and the standing cornstalks, the Russian thistle was at first slow in spreading. In 1877 it first appeared in Yankton County, east of Bonhomme, and five years later it had spread in the counties to the north and west of Bonhomme. It continued gradually to cover new territory until 1888, when it had infested most of the counties between the Missouri and James rivers south of the Huron, Pierre and Deadwood Division of the Chicago and Northwestern Railway. The strong winds during the winter of 1887-8, followed by the dry summer of 1888, and possibly a fresh importation of seed into the flax fields of Faulk or McPherson Counties, caused the weed to spread within two years to nearly all the remaining counties between the Missouri and James rivers in South Dakota and to infest the southern tier of counties in North Dakota. At about the same time it invaded Northern Iowa and northeastern Nebraska."

This bulletin was written in '94, and since that time the different places in the United States from which the thistle has been reported are legion. It is already well established in Southern Idaho, and since it is reported from the city of Spokane, it will likely be but a few years at most before it will have made its advent into Northern Idaho. At present it is mainly found in the neighborhood of the Oregon Short Line Railway, but it has also been reported from far up the Snake river at Idaho Falls. It is most abundant, as far as the writer's observations went, in the neighborhood of Nampa, Canyon County, and in this place is especially prevalent along the banks of the

Phyllis ditch. It was here that the picture was taken which is given in this bulletin.

This plant is noxious in very many ways. It is, as our picture will demonstrate, particularly injurious to the ditch owner, as it fills up his ditch in the fall by breaking off near the ground, while at all other times in the summer its growth where unchecked is so dense as to prevent travel along its borders, and seriously to interfere with those constantly recurring repairs needed along all ditches that do not flow through a comparatively flat country. To the stock or sheep owners it is a serious detriment, at least in its mature condition, for nothing then will or can eat it; while its thick growth and prickly nature make it a serious obstacle in the movement of large flocks, the animals refusing to go through it. It is sometimes urged that it is a good forage plant, and I even heard one sheep man say, with grim humor I judged, that it ought to be protected for this very reason! It struck me at the time that his reasoning smacked of the same wise policy as that of Bopo in Lamb's essay on "Roast Pork," who gravely theorised that the only way to obtain good roast pork consisted in burning down the house in which the litter of pigs was domiciled! Granted that cattle and sheep do like the young plants, for in this condition they afford a fair and succulent forage, is this any reason why this weed should be allowed to wipe out all other vegetation, cultivation, and even habitation, as it is said to do in some of the steppe regions of Southern Russia? Surely other forage can be obtained in most of the plains regions of our state without accepting this dangerous advise from other states. It has been likewise claimed that the thistle is serviceable where there is much alkali in the soil. In Bulletin No. 34 of the Agricultural Experiment Station of Minnesota it has been shown that a great quantity of sodium is taken up by this plant from the earth, but no more in proportion to its size than by other "salt plants," while a chemical analysis shows that at the same time it is a huge feeder on the most valuable constituents of the soil, such as potash and lime, the best materials for the production of cereals and other crops. This same analysis has likewise shown that although this weed is a large container of nitrogenous matter, and there-

fore a good forage plant from this aspect alone, it contains also an immense amount of indigestible fiber, rendering it except in an early condition well-nigh indigestible.

#### DESCRIPTION.

The plant is an annual, the seed germinating from April to June, and sending up a little succulent shoot closely resembling some species of grasses and wild-buck wheat (*Polygonum*). Branches soon appear from the axils of the leaves, even those low down. With the advent of hot summer weather the long leaves dry up and fall off, giving place further up the stems and branches to spine-tipped leaves about  $\frac{1}{8}$  to  $\frac{1}{4}$  inch apart. Along the branches flowers appear from the angle caused by two bracts growing out at nearly right angles to the leaf. This flower is generally rose-colored, the parts thin and papery, and hiding a little coiled embryo or germ at the bottom. This when ripe is about 1-16 inch in diameter, in shape resembling a waste-paper basket, and "about one-half the weight of a flax or clover seed." The plant hardens as the season advances, till on the advent of fall its branches are like so many pieces of wire; then late in the season the whole plant breaks off just at the surface of the earth, and goes tumbling over the ground under the fall winds, scattering its seeds far and wide. According to Mr. Dewey, an average plant will weigh from two to three pounds, will cover from 4 to 9 square feet of surface, and will contain from 20,000 to 30,000 seeds.

#### ERADICATION.

Since this plant is an annual and does not ripen any of its seeds before the middle of August, the surest method of extirpation is to cut the bushy plants just before the seeds are ripened, allow them to dry out, and burn before the fall rains begin. It has been found in some places that a thick growth of thistles can be entirely burned up if fire is placed in their midst on some windy day in a dry fall. Where such circumstances obtain, this is one of the surest means of eradication,



as thereby seeds dropped upon the ground are destroyed with those still remaining on the plants, together with the plants themselves. I have been told, I know not with what truth, that in some localities in the Great Plains region the cured stalks afford a very fair substitute for wood in furnishing steam to stationary engines. This would apparently create a very legitimate demand for them if care were taken to cut them before the seeds were ripe.

It is an indisputable fact that the "sage-brush" (*Artemisia*) of the southern plains deters the spread of the thistle. This was illustrated forcibly not far from Caldwell, Idaho. A gentleman informed me that a large piece of sage-brush land was cleared preparatory to putting it into a state of cultivation. No thistle had been noticed on or near the land previous to the clearing. The year after, however, the land was self-sown with thistle seed on the cutting away of the sage-brush and the consequent laying bare of its surface to some chance-rolling thistle, and that fall I was assured the thistles stood so thick that a man could scarcely find his way amongst them. This should serve as a lesson to land-owners in that country as to what will be the state of affairs when the sage-brush is cut away and large fields opened up to the thistle, unless stringent laws are passed for its suppression. A second means of eradication is found in the liking sheep have for this plant when it is in a very young condition. There is no doubt that this plant could in a measure be destroyed, even where it has taken possession of the land, if large bands of sheep could be pastured upon infested fields of limited area.

However it be accomplished, it has been proven in many states that absolute destruction, and this before the seeds be ripened, will in any degree stop its onward march. Fences, ditches and other hindrances are but temporary maskeshifts. Furthermore, the warfare waged by one man or by a few men in a community where thistles abound will avail them little; there must be organized cooperation. With the wonderful means of dissemination possessed by this plant, what permanent benefit can accrue to any one in waging incessant warfare against it,

when perhaps a mass of thistles on the opposite side of the line-fence testifies to the indifference of your neighbor? In a good agricultural community and one having a dense or even moderate population, all should rise against this pest as did the whole Roman world against the threatened invasion of Attila the Hun.

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### TUMBLING MUSTARD.

(*Sisymbrium altissimum*, L.)



Fig. 3.

This plant is also a first class tumbler, and bids fair to

rival the Russian thistle in vicious characteristics. It has not the prickly nature of the thistle, but this very lack probably accounts for its more rapid dissemination in sage-brush countries. In a more open country also it would probably cover more ground in a given time, for it is if anything more round and lighter

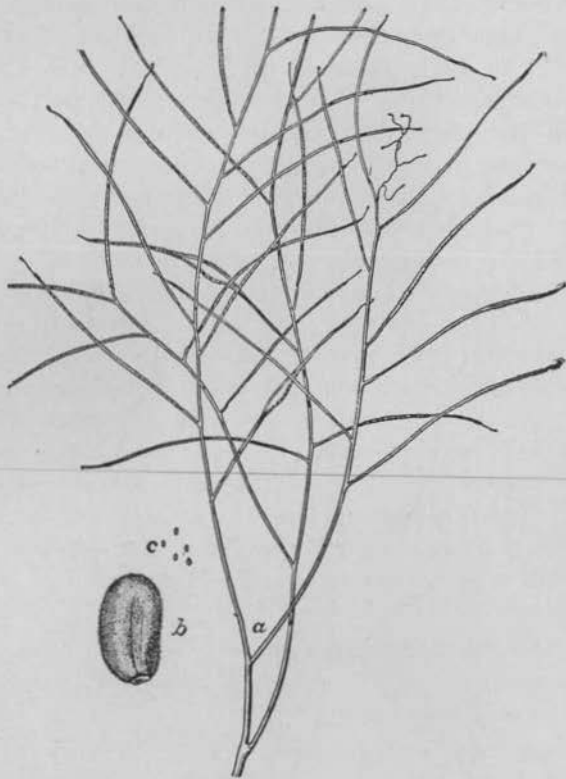


Fig. 4.

than the thistle,—attributes that would favor its more rapid dissemination. It was first noted two years ago this coming summer by Mr. Coville of the Department, and yet on making a visit to the southern part of the state last summer the writer found it well established all along from Mountain Home in Elmore county to Weiser in Washington county. Though it takes kindly to the

unirrigated sage-brush land, it is not so thoroughly established that it could not be extirpated at a moderate expenditure of money; let it remain unchecked for a few years, however, and hundreds of thousands of dollars could not extirpate it. The history of the advance of this pest in the Northern States and in British America is interesting from its fearful rapidity. Its native home is in Southeastern Europe or Northwestern Asia, and it has been known in those countries as a serious trouble for many years; but it was only in 1878 that it was first noticed in America, in the ballast grounds of Philadelphia. Since that time, probably through fresh importations of seeds, it has made its way rapidly westward till the Pacific Ocean has been the only barrier to its progress, it being now quite well established in Vancouver Island. That it is not to be considered a plant of little noxiousness, we may take the experience of places where it has been very abundant. Mr. Dewey tells us, "About ten years ago the people about Indian Head, Assiniboia, were warned of the dangerous character of tumbling mustard and advised to eradicate it before it had spread farther. They did not heed the warning, however, until the weed had invaded their fields and injured their crops. They then began to fight it, and last year (1895) in that one locality 1,200 acres of tumbling mustard were plowed under to prevent it from seeding, and many acres which otherwise would have produced paying crops were kept in barren fallow."

As yet I have seen no specimens in Northern Idaho, but as a few isolated specimens were collected at Salmon, 90 miles from a railroad, it may be expected any year.

Its means of dissemination, apart from its tumbling, is through baled hay and the sweepings from freight and stock cars.

#### DESCRIPTION.

This plant is, as the name implies, a member of the mustard family, and with us an annual. It has a round, bushy nature, and breaks off when mature, near the surface of the earth. It grows from two to four feet high and branches freely. The

Figure well depicts its general aspect, and especially its compound leaves which sometimes reach a length of 8 to 10 inches. The upper leaves are almost thread-like, with narrow lobes. In late spring the plants put out their yellow blossoms in a gradually lengthening raceme, each one of them about  $\frac{1}{4}$  to  $\frac{3}{8}$  inch long, and much like the other mustards. The plant continues to produce flowers even after the lowest pods have begun to ripen, so that in the fall the whole plant is covered with them. Prof. James Fletcher of Canada estimates by careful calculation that one well developed plant contained 1,500,000 seeds. The plant is easily told where leaves and flowers are lacking, by the mature pods which are round and long, containing often over 100 seeds each, and standing out at almost right angles to the stem on round stiff stalks (pedicels) which are of about the same size as the pods. These latter split, as do those of nearly all of its relatives, by means of two strips or valves, which finally drop off with the seeds and leave the thin, white, spongy axis behind. The seed is as given in the cut, sometimes yellowish but more frequently of a greyish cast, and can be readily told by dropping it into a little water, when a sort of "fuzz" develops on its outer coat, due to a gelatinous exudation.

#### ERADICATION.

As has been hinted in the general introduction, it is no easy plant to extirpate when once it has obtained a good footing in a country, and yet by persistence it can be destroyed. As it is an annual, it is, when taken in time, easily eradicated by cutting at the root, a fact which renders it much less difficult to cope with than such a plant as the Canada thistle. In fact an immense amount of these plants could be destroyed by one man in a day, provided he attack them with a heavy, sharp hoe before any of the seed-pods have formed and the plant is still tender. The plow is by all means the best engine of destruction where the nature of the soil and crops will permit its use, if we are careful to plow the ground before any of the pods have ripened their seeds. If by some chance many of the pods have matured before we attend to the work, the surest agent of destruc-

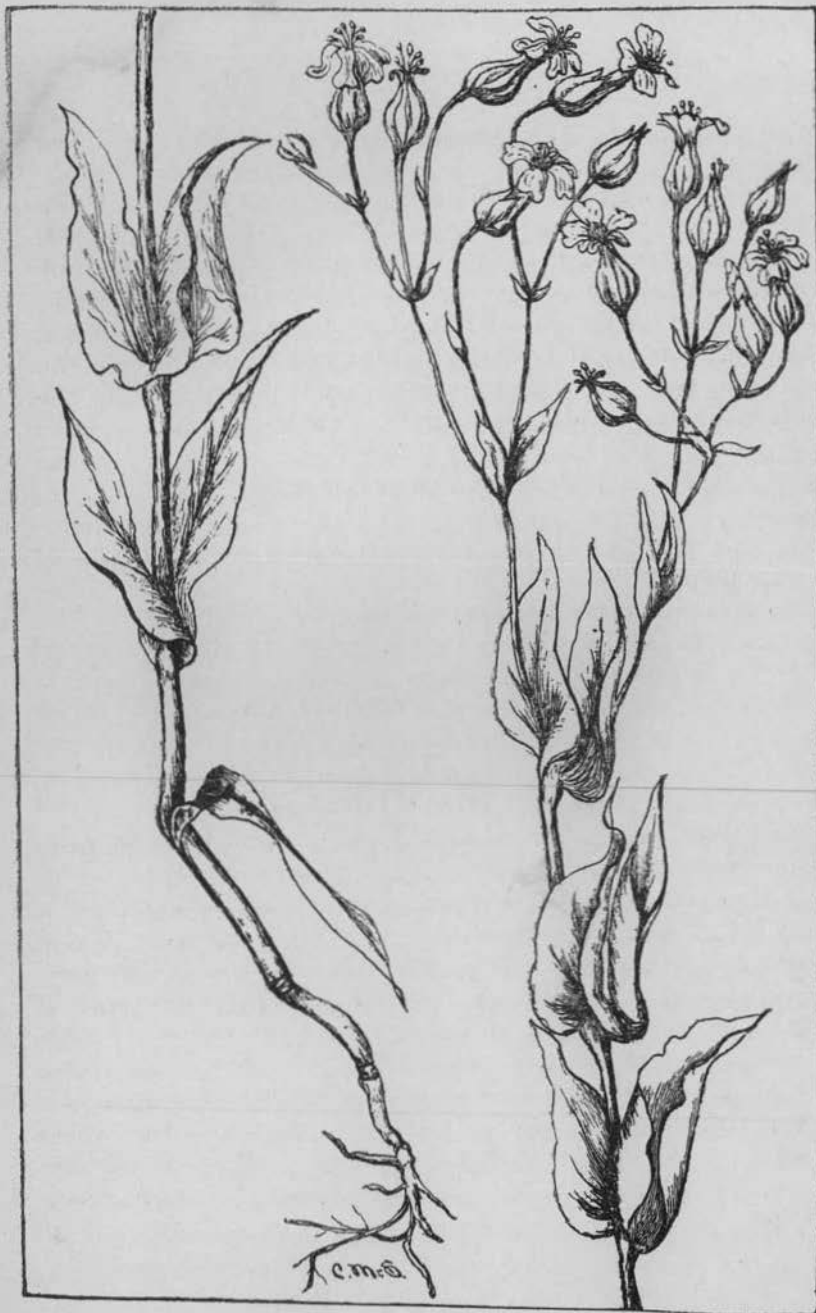
tion, providing its use is permissible and the plants stand close to one another, is by firing the field, and thus destroying the seeds with the plants. I have seen large tracts in the vicinity of Nampa, where the plants were so large and stood so close together, that it would seem well-nigh impossible to destroy them by any other means. Where firing is impracticable, either from the plants being too scattered or the danger of fire too great, and the tumbling mustard has been allowed to go to seed, two methods have been practiced with success. One is to plant the land with some valuable annual crop that will itself demand much cultivation by team and by hand, then cut the crop before either millet or mustard have matured seeds, and then immediately plow the land. As most of the mustard seeds germinate with the millet, this method will almost entirely dispose of the mustard.

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### COCKLE, COW-HERB.

(*Saponaria vaccaria*, L.)

This is another pernicious weed from Europe, though from its pretty flowers and soft foliage it is often cultivated in flower gardens. It is found in almost all parts of Idaho, yet it has proven its noxious nature only, so far as the writer has seen, in parts of Nez Perce and Latah counties. It is especially prevalent in the highlands above the Potlatch river, and many of the sandy-loam wheat fields of the magnificent American Ridge country are almost overrun by this weed. I call to mind one large field not far from Juliaetta in which but little else save the pink flowers and green leaves of this plant were to be seen. And yet this is not a very serious foe if it is sternly treated, as will be shown hereafter.



COW-HERB. Plate V.

## DESCRIPTION.

Annual, very smooth throughout, 1 to 2 feet high, branching freely. The opposite leaves grow together at the base, varying in form from oblong in the lower to ovate in the upper. The flowers are pink and are arranged in open cymes, that is one in each fork of the branches. The calyx or outer part of the flower is strongly angled and enlarges in fruit so as more or less to enclose the pod. The seed is nearly round, minutely roughened, black, and about the size of number 8 shot.

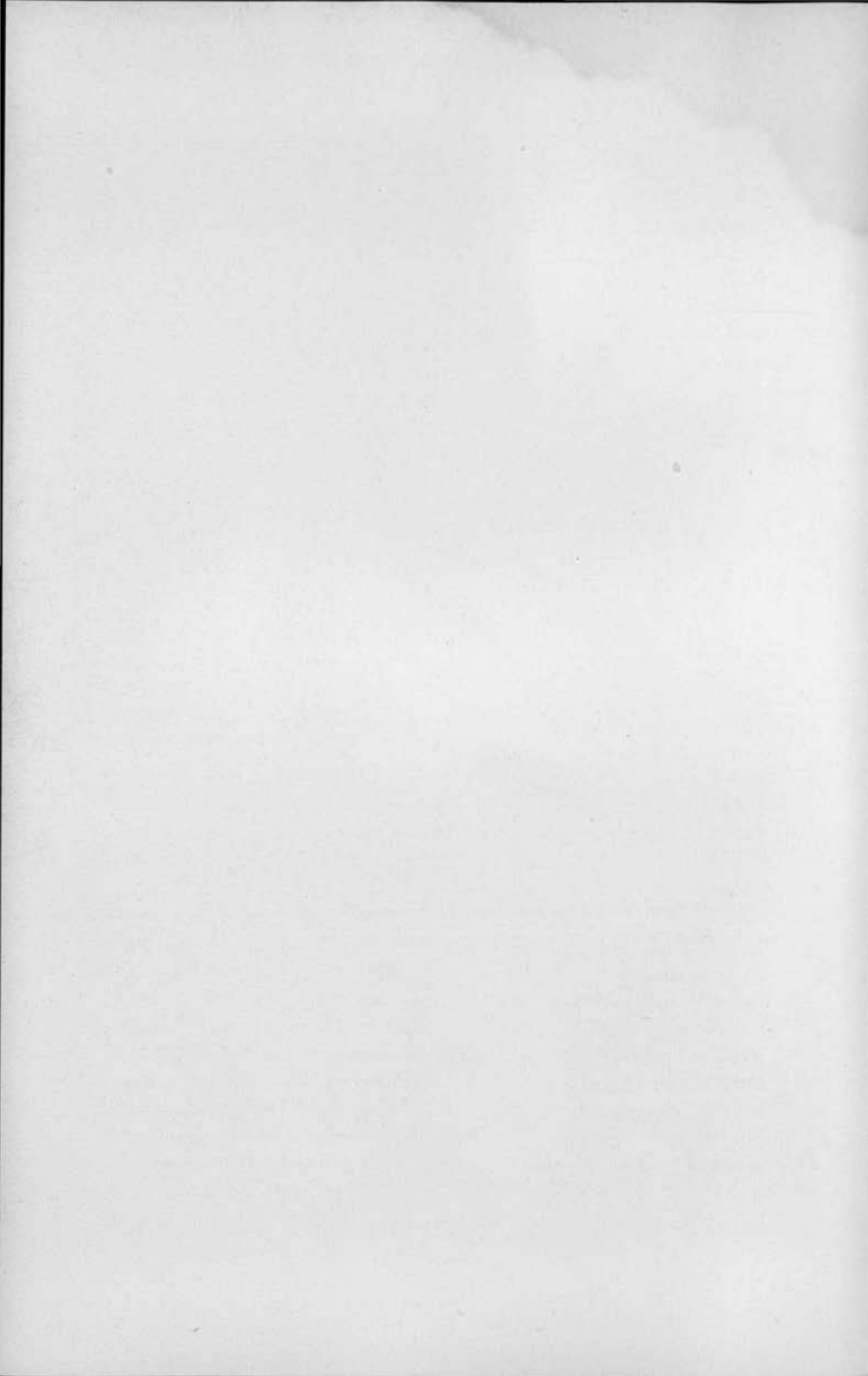
## PREVENTION AND ERADICATION.

It is more important to prevent this weed getting upon the farm, than to dispose of when there. There is no weed that shows careless methods of seed-sowing more plainly than does this. The seed stays where dropped, while the plant is in no sense a bad tumbler. If therefore adequate means of cleaning seed-wheat are adopted, this plant will never take possession of the farm. But there are thousands of instances where proper precautions have not been used to screen this seed from the wheat, and where consequently the farms are well nigh overrun with this pest. When such is the case there are two sure methods of eradicating it. The first is to plant the land with some crop that requires much cultivation, and especially hoeing. Under this process the cockle will disappear, for much cultivation the plant cannot stand. This applies to the land stirred by plow or cultivator; the plants that happen to grow in the rows of vegetables or fruits will be increased in size and vigor from the repeated cultivations. Such plants should be cut out carefully with the hoe, for a few overlooked or not attended to will soon re-seed the field. As has been pointed out before, and for the reasons there stated, hoed crops do not generally pay yet in the Palouse or Lewiston countries. Another means must therefore be invented to combat this foe, and that is the late summer fallow, or plowing up the field just as the plant is in blossom and before it has ripened any of its seeds. When





CANADA THISTLE, STREETS OF BOISSE.



this is carefully done, and it includes not only careful plowing so as entirely to cover the plants, but thorough destruction of all cockle standing in the fence corners, this weed can be almost entirely extirpated. I say almost, for as all of the seed may not germinate the first season, some will appear the next year and should be pulled up by hand before they have time to undo all that was done for their destruction the previous summer.

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## CANADA THISTLE.

(Carduus arvensis.)

This is placed amongst our worst weeds on account of its injury to fields and pastures in many parts of the Union, and the difficulty of its eradication: not that it is now or likely to become for sometime in the future prevalent or harmful in the state. In fact, as has been before stated, this weed is known to the writer only in two localities in Idaho, one about Boise, and one at Sand Point on Lake Pend d'Oreille. But the fact that it is flourishing in both of these widely separated regions of the state, added to the reputation it bears of being one of the worst pests and the most difficult to deal with that many sections of the United States possess, should give us some cause for alarm.

Though commonly known as the Canada Thistle, the plant is a native of Europe, having been early introduced into Canada and the eastern United States, from which countries it has steadily traveled westward. This plant is, viewed as a weed, a splendid example of the "Survival of the Fittest," for its long, running roots, its numberless seeds, each provided with its own flying apparatus, its sturdy nature, and its extremely prickly leaves, stem and heads, render it a plant very capable of making its own way in the world. Luckily for the farmer, the Canada thistle spreads rather slowly,—in fact very slowly compared with some weeds. This is due mainly to the lack of

fertility in most of the seeds, or to its being, as the botanist would say, more or less a dioecious plant. Most of the seeds seen floating in the air will be found sterile on examination, the fertile being generally too heavy to be carried any great distance save during severe storms. While, therefore, its dissemination by seeds is rather slow, its growth by means of long, white rootstocks is, for this mode of progression, rapid. An acre of ground may in this way be covered in the space of a few years from one vigorous plant. This, as has been said before, is slow progress, especially when compared with that of such weeds as the Russian thistle, tumbling mustard, and prickly lettuce; but what this plant lacks in rapidity of dispersion, it fully makes up in its almost unconquerable hold upon the soil. The writer has known fields in New York state where the owner had ceased trying to extirpate the thistle, after many trials, and contented himself with cutting what wheat, oats, or grass could be harvested without too great a mixture of thistle, and leaving great spots of almost solid thistle to remain uncared for. Doubtless under improved methods such a case would be rare today, and I only cite it to show what an almost unconquerable opponent this weed may become in certain rich, porous soils. "What emblem to commemorate the fall of Adam, the first agriculturist," says Dr. Millsbaugh in a West Virginia Bulletin, "could be more significant and appropriate than the Canada Thistle?"

#### DESCRIPTION.

A perennial, propagated mainly by rootstocks; its stem is more slender than that of most other thistles, while its leaves are extremely prickly, lighter colored, thinner, and even more curled than in the bull-thistle; the heads are also smaller and aggregated on the top of the stem, while their flowers are rose-purple.

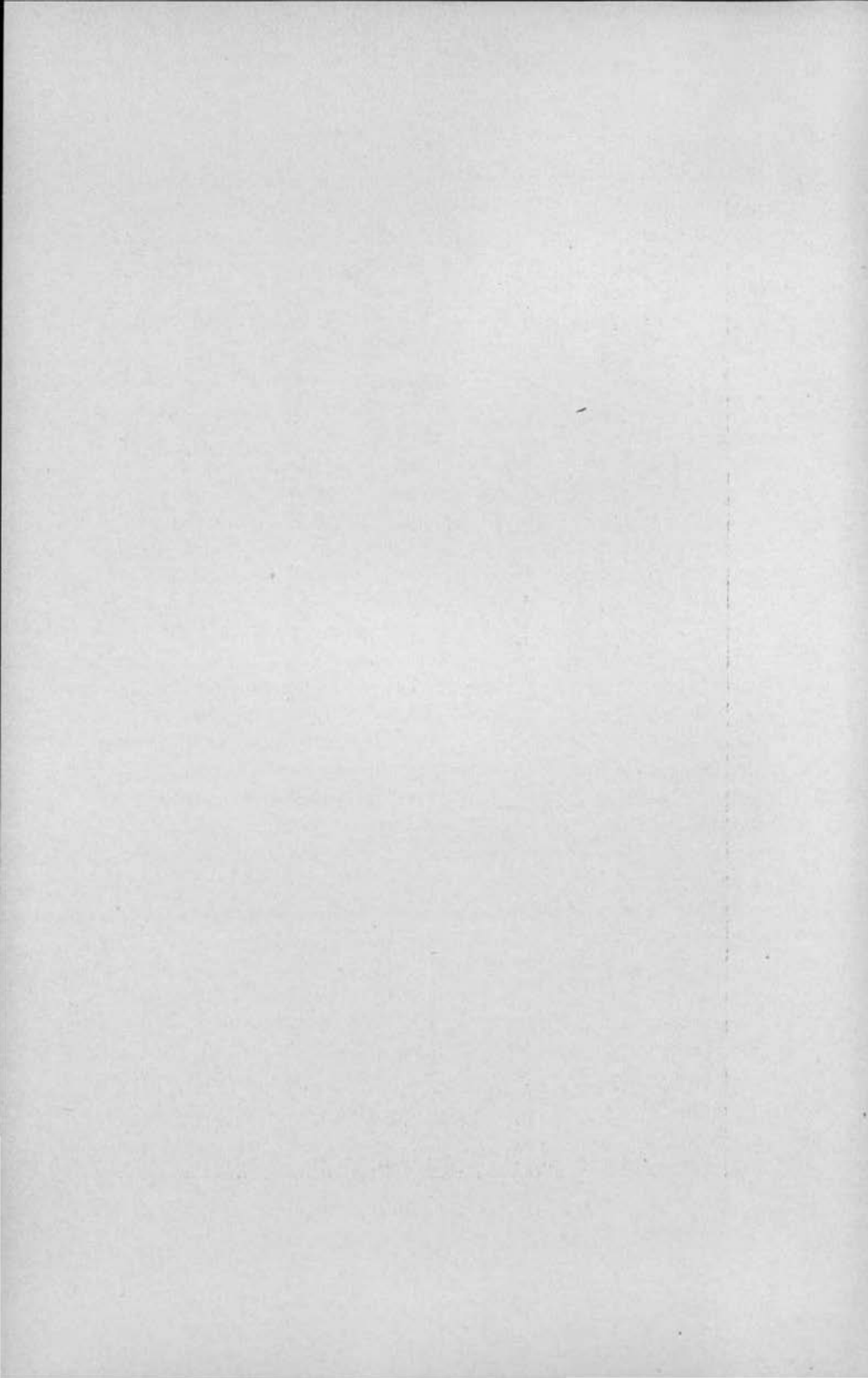
#### ERADICATION.

This weed is commonly introduced into a new country with hay, or in packing for heavy stones, slabs, castings and the like.

Plate VII.



CANADA THISTLE, AT SAND POINT, LAKE POND D'OREILLE.



By this means it was most certainly introduced into Northern Idaho, for it completely occupies the small yard of an abandoned house at Sand Point. It would therefore be a wise precaution if all such packing were invariably burned, by which means not only the seed of the thistle but those of many other vicious weeds could be prevented from finding new homes.

As soon as a clump of the Canada thistle is found anywhere it should be dug out, or be killed out with liberal applications of salt or kerosene. In digging it out the utmost precautions should be exercised to get it all out. A piece of a rootstock the length of a finger left in the ground may render all the former work of no avail. A gentleman of England gives this experience with the field thistle, as it is named there, during one season. As an experiment, he planted in his garden in the month of April a piece about 2 inches long and having a small head of leaves. In November he dug it up, when he found that this small piece had thrown out shoots 8 feet long. Some of these were about 6 inches from the surface, while others had penetrated downwards a distance of  $2\frac{1}{2}$  feet. The whole weighed 4 pounds. In the spring, from little pieces he had failed to dig up, though he had exercised care, there appeared some 50 to 60 young heads! Various are the methods of eradication advocated for the destruction of this weed when it infests a place in any quantity. One gentleman in New York state completely cleared a field, which was previously a mass of thistles, by the following means. Said he, "Plow the ground in June, drag twice in July, and then gang-plow three times during August two or three inches deep, harrow the ground every time. I plow with a spring-toothed harrow. Any tool that will cut off the tops the first, second, and fourth weeks of August certainly uses them up here completely."

In the year 1890 a couple of experiments were instituted by Prof. Burrill, Horticulturist and Botanist of the Illinois Experiment Station, that I should like to reproduce here in full would space allow. I shall however content myself with giving the main points; the whole will be found in Bulletin No. 12 Illinois

Agricultural Experiment Station. The first experiment was conducted upon a patch of ground about  $2\frac{1}{2}$  acres in area, and upon which the thistles stood "so thick upon the ground that it seemed impossible for any more to gain standing room. Unless one wore leather leggins it was painful business to walk through them, and horses refused to be driven through for the same reason." The experiments were begun July 17, when the patch was in full bloom. By October 8, of the next year hardly a plant was to be found alive! The means that brought about this end were summarized by the professor as follows:

1. Cut the thistles when in full bloom (July) as close to the ground as possible.

2. Plow about three inches deep and sow millet or Hungarian grass, seeding heavily, harrow. This may follow the preceding at once or after two weeks' delay.

3. In September plow under the crop, or save it for hay, as desired. At all events plow and seed liberally with rye.

4. Plow under the rye in May and seed again with millet, or Hungarian grass, or plant to some hoed crop (corn) and give the most thorough cultivation, with continued searching for, and destruction of, every remaining thistle.

5. Continue the clean cultivation and sharp lookout for thistles another year.

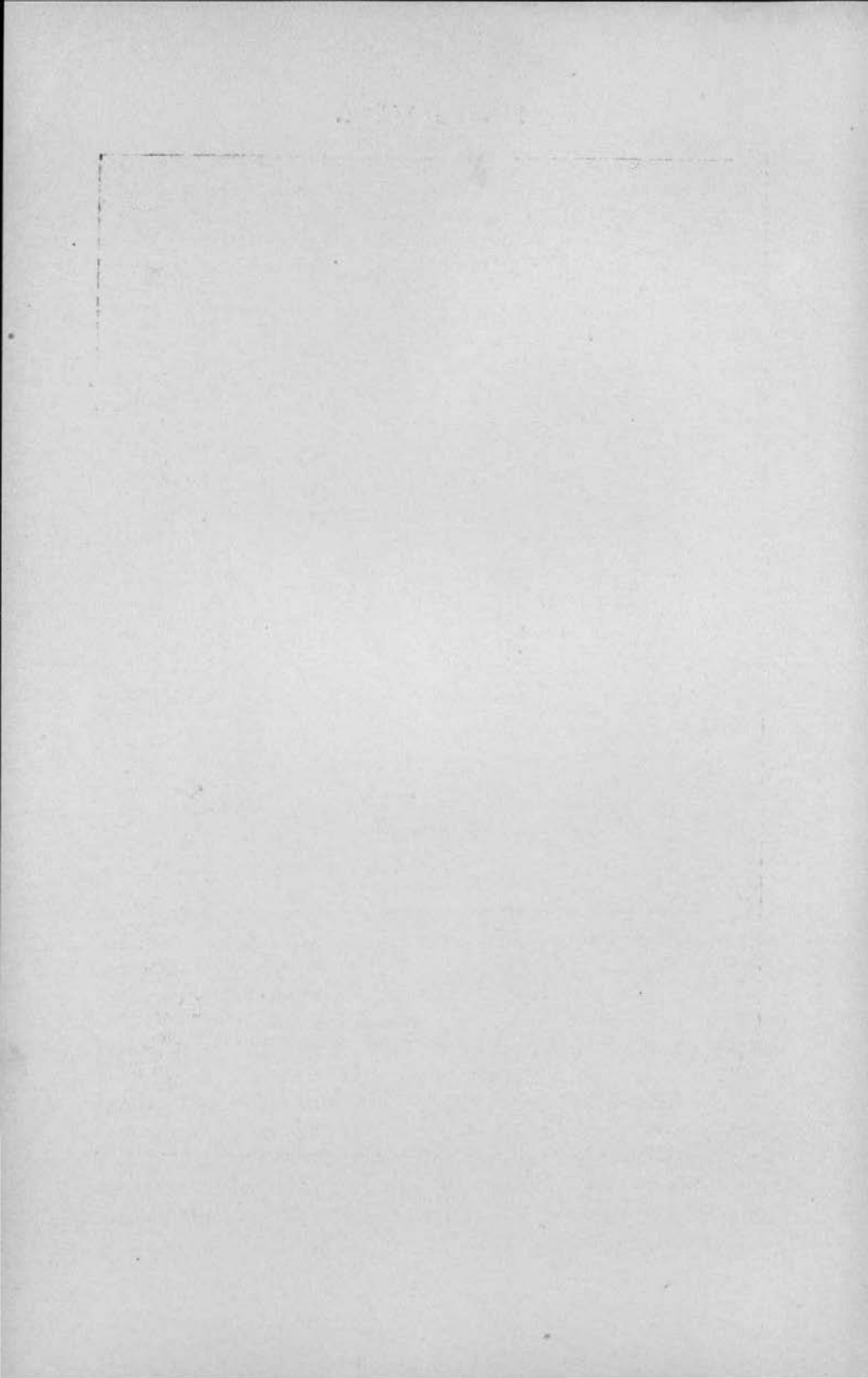
The second experiment was conducted upon a small area containing 8 square rods, in blue grass sod. The soil was poor, consequently the grass made a poor growth, which fully accounted for the abundance of the thistle, for it has been proved that where a heavy sod can be obtained, thistles have very little chance. Beginning June 17, 1889, the plants were cut down with the hoe just beneath the surface of the ground, the operation being gone through every week during the growing season. The days and the number of thistles cut were as follows:



Plate VIII.



FLAX DODDER IN ALFALFA, NEAR SHOSHONE.



August 5, . . . . .	98.	September 2, . . . . .	74.
August 12, . . . . .	107.	September 9, . . . . .	78.
August 19, . . . . .	80.	September 16, . . . . .	62.
August 26, . . . . .	84.	September 26, . . . . .	26.

The plants were noticeably smaller towards the end of the season, as well as less in number.

The same process was continued during 1890, save that the cutting took place every month, with the following results:

May . . . . .	1.	September . . . . .	0.
June . . . . .	1.	October . . . . .	1.
July . . . . .	3.	November . . . . .	0.
August . . . . .	1.		

Total cost of first experiment, . . . . . \$26.25.

Total cost of second experiment, . . . . . 4.00.

I think therefore I am safe in saying that all of the thistles thus far known in Idaho, two patches in Boise and the one at Sand Point, could be destroyed for less than one hundred dollars.

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## DODDER.

(*Cuscuta* sp.)

This is a serious pest to alfalfa growers, especially in the southern part of the state where the irrigation and other requisites for the successful growth of this forage plant are most found. There are species that attack the clover, and one of these found on the alfalfa is a serious scourge to the flax-fields in many localities; but alfalfa is the only cultivated plant so far noticed in the state by the writer that serves as a host for this parasite. In many places in Southern Idaho fields were seen perfectly yellow with dodder vines, and their crops were of a consequence far inferior to those of contiguous fields where the parasite did not occur. Some I should judge would hardly

pay to harvest. The fields that seemed most subject to its depredations were observed in the neighborhood of Weiser in Washington county.

#### DESCRIPTION.

Dodder is an annual plant that leads a parasitic existence, obtaining its nourishment from the elaborated sap of other plants by means of little suckers or haustoria. It has no roots as it does not need the soil to sustain its growth, and for the same reason it has no leaves as it needs no "lungs nor stomach" to elaborate its sap, the office of ordinary leaves. It is a little, yellow or yellowish-red vine that spreads from branch to branch and from stem to stem, until it forms a perfect net-work of pretty threads covering at times yards of space in a single season. The vines at places wind closely around the stems of the host, and there put out their little suckers, inserting them through the bark of the host and draining its life-blood. The flowers are small, arranged sometimes in close cushions, at times in little spheres, and at others in little umbels. The second form is found in *Cuscuta epilinum*, Weihe., the third in *Cuscuta decora*, Choisy, var. *indecora*. Engelm. The styles in the first are linear and slightly divergent, those in the latter capitate and slightly unequal. The lobes of the corolla in the first are obtuse, in the second acute and turned in at the tip. In the first the corolla does not rise above the calyx, in the latter it is more than twice as tall and very warty on the back, especially near the ends of the corolla lobes. A species closely related to *C. epilinum* is the more common parasite on alfalfa in most of the states, and this is known as *Cuscuta epithymum*, Murr. Strangely enough the latter species prevails in Nevada on alfalfa, the former in Wyoming. All of these are from Europe, though several native species are found in many parts of the United States on wild plants. The seeds are brown, nearly round, in some species angled and large for the size of their pods.

## ERADICATION.

Owing to the fact that dodder does not appear to any extent in Northern Idaho, to the writer's knowledge, I can only offer on this this point what I get from the writings of others, save in one instance. On one of the plats of alfalfa at the Moscow Station, there was observed a mass of dodder in the summer of 1896, but this was cut out and destroyed, and it has not since reappeared. There is no doubt that the best method of extirpating dodder from a field is to set it on fire and destroy the whole crop. Since most of our alfalfa fields produce more than one crop, this would work no special hardship upon the owner. He should see to it that the first crops, desired for hay, should be cut before any of the dodder can have ripened its seeds. Then he should leave the last crop till it is dry enough to burn, when firing this will destroy not only all the dodder on the vines but all the seed that may have dropped to the ground. It should be borne in mind that to destroy the dodder permanently in alfalfa fields, it must never be allowed to ripen its seeds; or, if this has not been prevented, that all seeds on the ground be destroyed before they can germinate. This burning should take place in August, and it need not be feared that the roots will be injured for the next year's crop. Better results can be obtained by first mowing the alfalfa and allowing it to dry out before burning.

If the dodder has only just gained an entrance into the alfalfa field, it can always be taken out by mowing the spot, and thus the majority of the crop be saved. The farmer who adopts this means of getting rid of the pest should see to it that the mowing take place before any seeds can have ripened, or his work is time and money thrown away. This is but a precarious method of riddance if many spots of dodder appear, for the most careful eye is apt to overlook patches in a large field.

Such are the best means of getting rid of the dodder, but far better than this is not to get it in the first place. If the farmer would be careful always to screen his alfalfa through

wire netting having about 20 meshes to the inch, he could rid himself of this pest, for though the seed of dodder is large for the size of the plant and its pod, it is not so large as the seed of alfalfa. A small magnifier will always show the difference between the granular coat of the dodder seed and the smooth one of the alfalfa. Further proof can be gained by examining the germ or embryo of the seed, for while the alfalfa seed shows plainly its two little seed-leaves or cotyledons, the dodder has no cotyledons, being merely a coiled body a little larger at one end than at the other.

## FALSE FLAX.

(*Camelina sativa*, Crantz.)

As the name would seem to imply, this weed is most noxious in flax-fields, for it is hardly tall enough to vie with the cereals in its struggle for existence. It exists to a limited extent in Southern Idaho, especially in the fields near railroad depots, but in some of the fine flax fields of Northern Idaho it is a serious evil, and may even become a drawback to the production of flax or its seed.

### DESCRIPTION.

The false flax is a member of the great mustard family, though its round short pods would hardly lead a superficial observer to think so. Like all of the previously-mentioned weeds, it is a native of Europe, probably reaching this country in shipments of flax seed. It grows from a foot and a half to two feet high, and is sometimes unbranched, but generally branches freely. The surest means of identification is furnished by its mature or maturing pods, which are short pear-form to nearly orbicular. This is a character presented by no other weeds of this order in this country, and therefore leads to its easy recognition. Each pod is supplied with many small seeds, so that one

plant of the false flax may furnish a host of seeds, and a dozen plants will soon sow a whole field. Examples of this are only

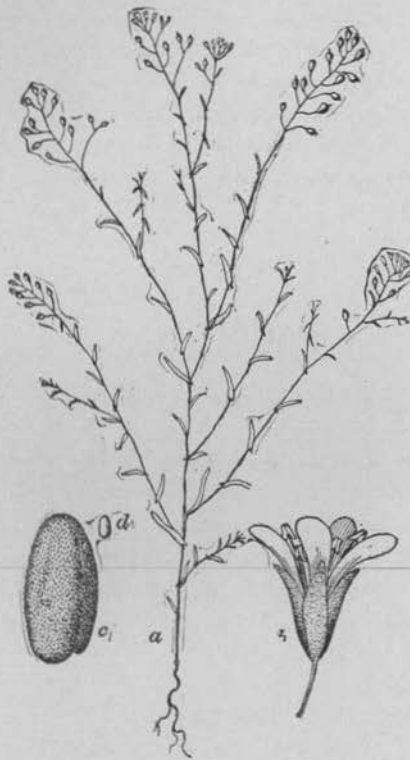


Fig. 5.

too common in Nez Perce county, where the rich, sandy loam common there furnishes a natural hot-bed for this weed and many more.

#### PREVENTION AND ERADICATION.

When this weed is once well established in a field, it is very difficult entirely to extirpate it. The fact that this plant ripens some of its pods early in the season and long before crops are

ripe, or even before they are generally cut for hay, renders it a difficult pest to overcome. The only ways of fighting it seem to be, first, pulling it by hand when not too thick; second, cutting down the whole crop before any false-flax can have matured its seeds; third, the much more rational treatment of planting some hoed crops upon the land the year after the flax is first discovered; fourth, summer-fallow till June, then plow up and seed with about a bushel of wheat, which land, when the grain is up, pasture with cattle and plow up again in the fall, seeding heavily with wheat.

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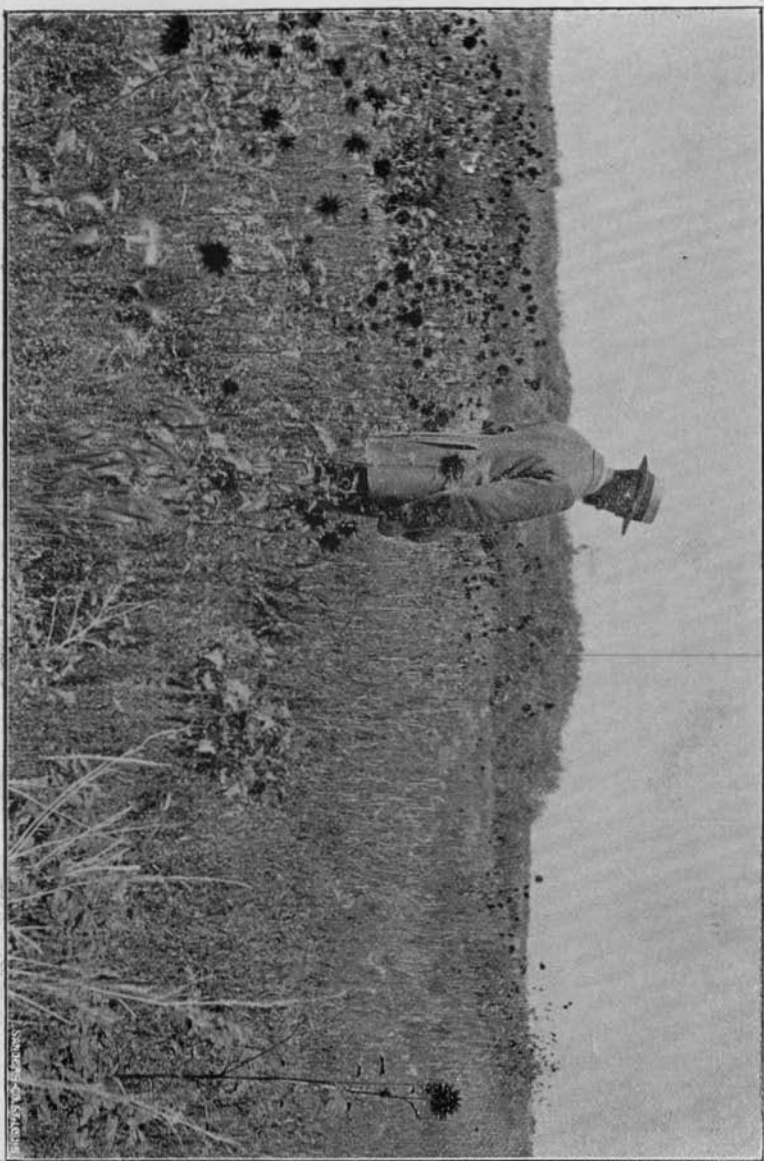
## SUNFLOWER.

(Helianthus annuus, L.)

This is a weed that belongs to North America, its original home probably being the southern United States and Mexico. It is now, however, fairly entrenched in all the states west of the Mississippi, and is no uncommon weed east of this region. It seems capable of accommodating itself to many kinds of soil, in the drier plains reaching the height of only a few inches, while in the irrigated lands of Southern Idaho, it attains almost its maximum of stature, often growing to far above the head of a man. Throughout this whole region it is becoming a rather serious pest, for though it will not stand cultivation in hoed crops to any great extent, in crops that will not admit of plowing it flourishes amazingly. As it ordinarily towers above most crops, such as the cereals and pease, it does not shade them injuriously, but still it must take largely from the fertility of the soil. In orchards that are not cultivated regularly it forms at times a perfect jungle, in this regard proving a benefit, as it compels the lazy orchardist to take proper care of his orchard or lose his trees. The plant is almost unknown in Northern Idaho, the two related plants, the Silvery Sunflower (*Balsamorhiza sagittata*) and the Black Sunflower (*Wyethia amplexicaulis*), taking its place but both yielding almost immediately to cultivation. Hence I



Plate IX



SUNFLOWERS, SQUIRREL-TAIL GRASS, AND PEVERTY-WEED TAKING POSSESSION OF A WHEAT FIELD NEAR  
BLACKFOOT,

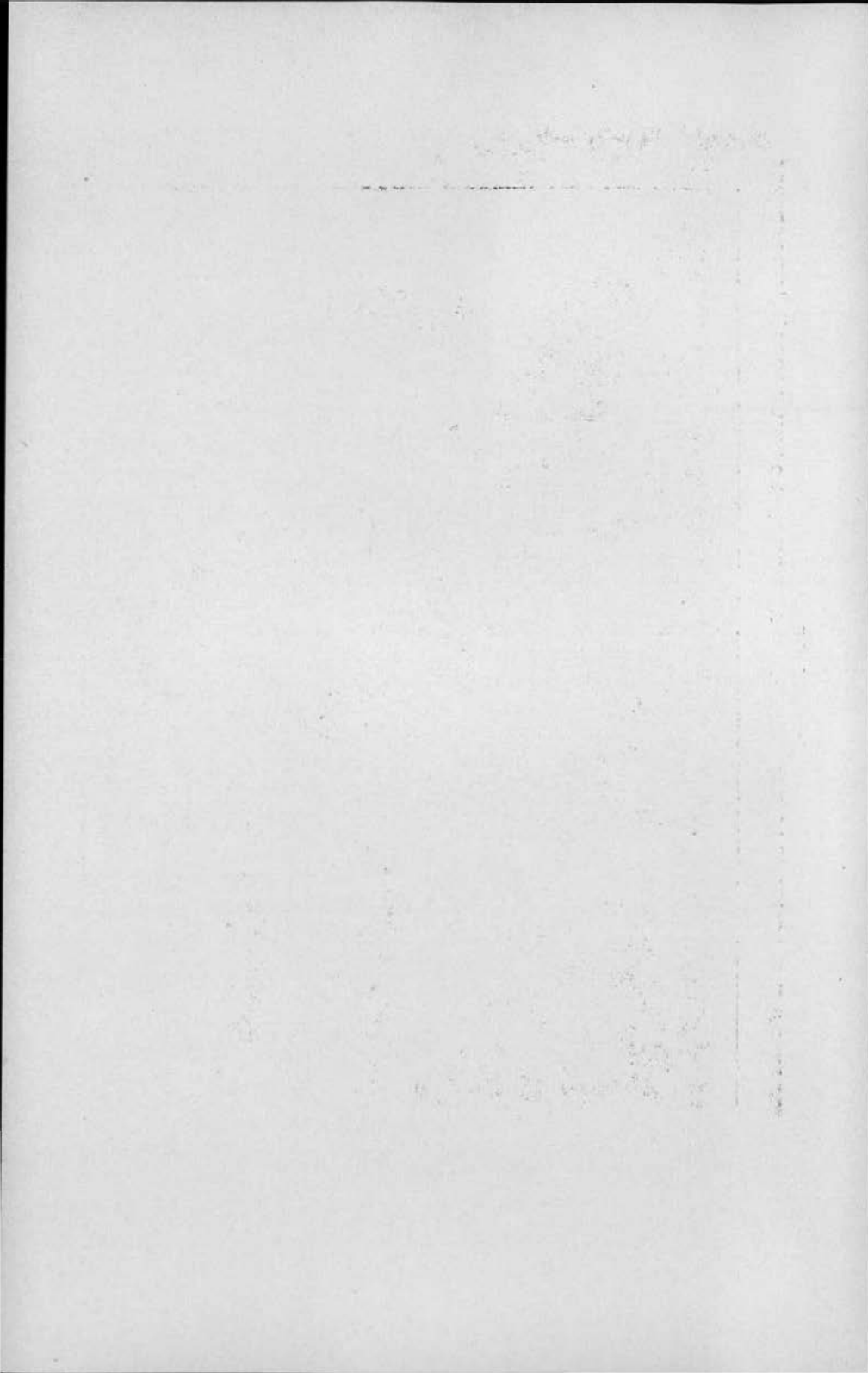
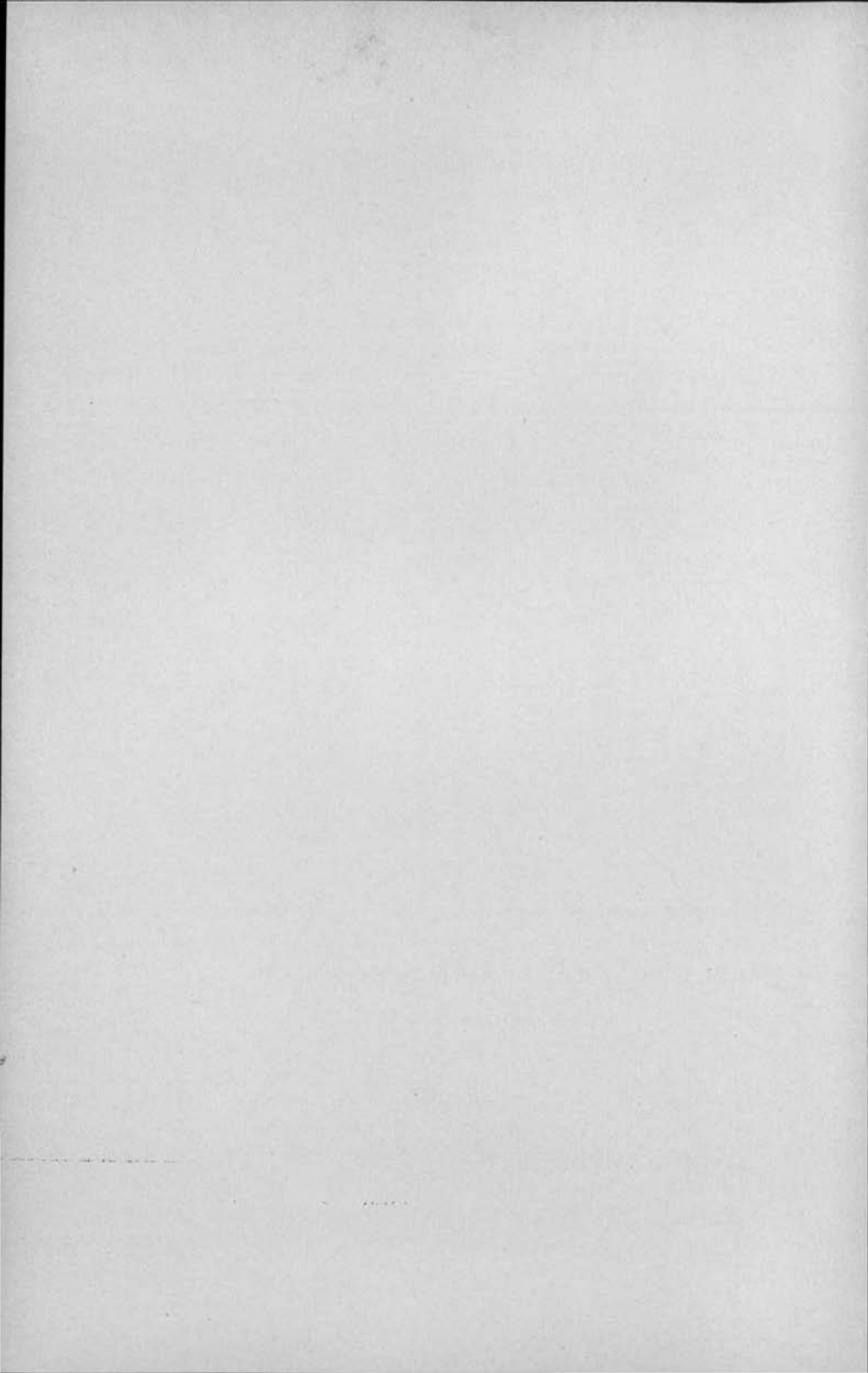


Plate X.



SQUIRREL-TAIL GRASS.



know little about the best methods of eradicating it, save what I saw and learned from residents in the southern counties.

#### DESCRIPTION.

An annual, with erect branches or unbranched stem, from a foot to 7 feet high. The lateral branches flower after the main head has gone to fruit. The whole plant is rough and short-hairy, but having a decided green hue, very different from the silvery sunflower or Balsam-root. Varieties of this plant are so common in cultivation, that it seems needless to enumerate its other characteristics.

#### ERADICATION.

As far as I could learn this consisted in pulling up the stems in uncultivable crops, and in thorough and constant cultivation in plowed or hoed crops. These seem to be the only available ways to combat this weed, for, since the country abounds in them wherever there is the slightest irrigation or natural moisture to the land, it is only by unremitting warfare that they can be overcome. In fact the very soil of the plains seems filled with the seeds so that the mere digging away the sage-brush and stirring the earth will produce them in numbers. It is no wonder that amongst the more ignorant they are thought to be the product of spontaneous generation!

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### SQUIRREL-TAIL GRASS,

(*Hordeum jubatum*, L.)

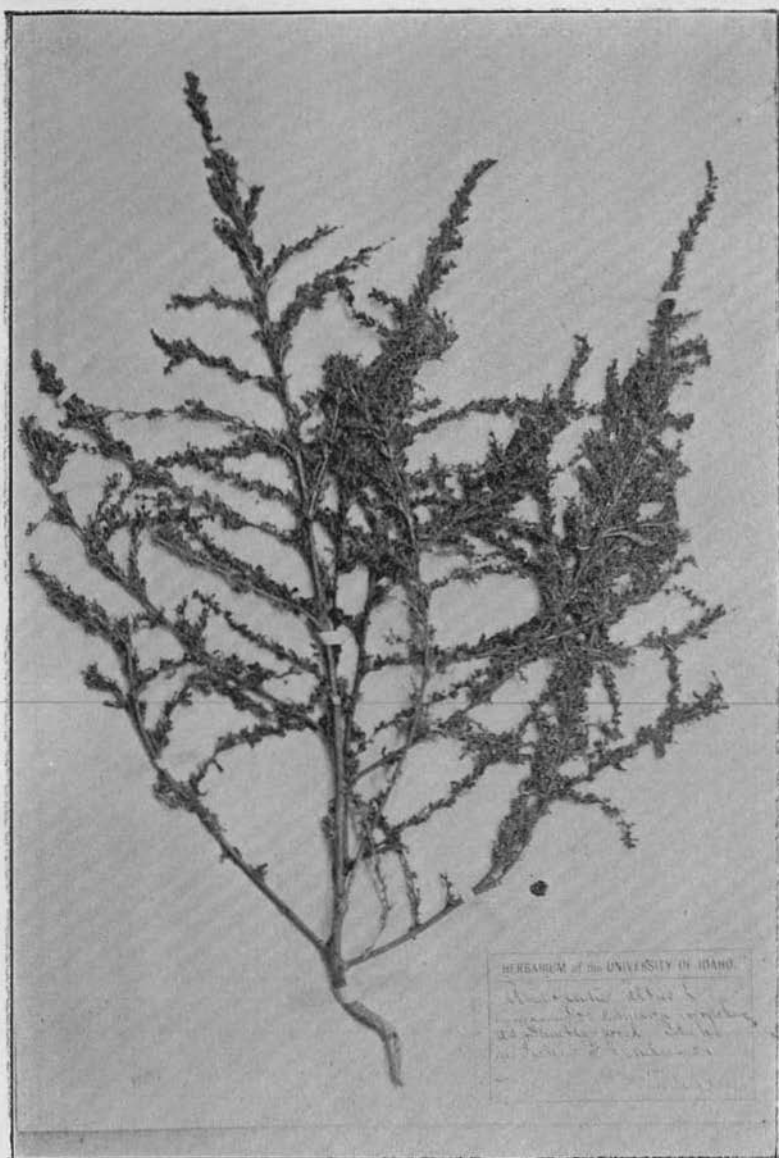
This beautiful but pernicious grass is a regular concomitant of irrigation in the western states. It is not meant by this that it grows nowhere but in irrigated lands, as it has been reported having been found near Tacoma, Washington, and has this year for the first time, as far as the writer has noticed, made its appearance about Moscow; yet certain it is that it finds its

natural home in fields and meadows that are over-irrigated, or growing spontaneously in naturally moist meadows and pastures. It is found in almost every district of Southern Idaho, where it becomes at times, as it does in other states, a sore pest to the stock-raiser, whether when cut with or for hay, or when it is eaten green in the field. The bad name attached to this grass is almost universal, and yet the writer saw once near the town of Challis several acres of this plant the seed of which had been sown for hay! While it is undoubtedly a fact that this grass if cut early, before the long awns have had time to ripen and harden, can be eaten with impunity, it is too generally the case that it is either cut too late or not cut at all, giving the awns time to acquire that stiffness and capacity for inflicting injury they are sure to acquire if left to mature. This viciousness is manifested in many ways. They are said to put out the eyes of colts and lambs, to form sores in the noses and often ulcer in the mouths and stomachs of animals, especially horses. These diseased areas are more commonly found in the region of the teeth, the stiff, barbed awns being forced down between the teeth and gums, causing such suppuration and ulceration that frequently the gums and parts of the jaws rot away and the teeth drop out. Any one who wishes more information as to the injury this grass inflicts upon stock will find the whole matter detailed in an excellent manner by Prof. Aven Nelson in Bulletin No. 19 of the Wyoming Experiment Station.

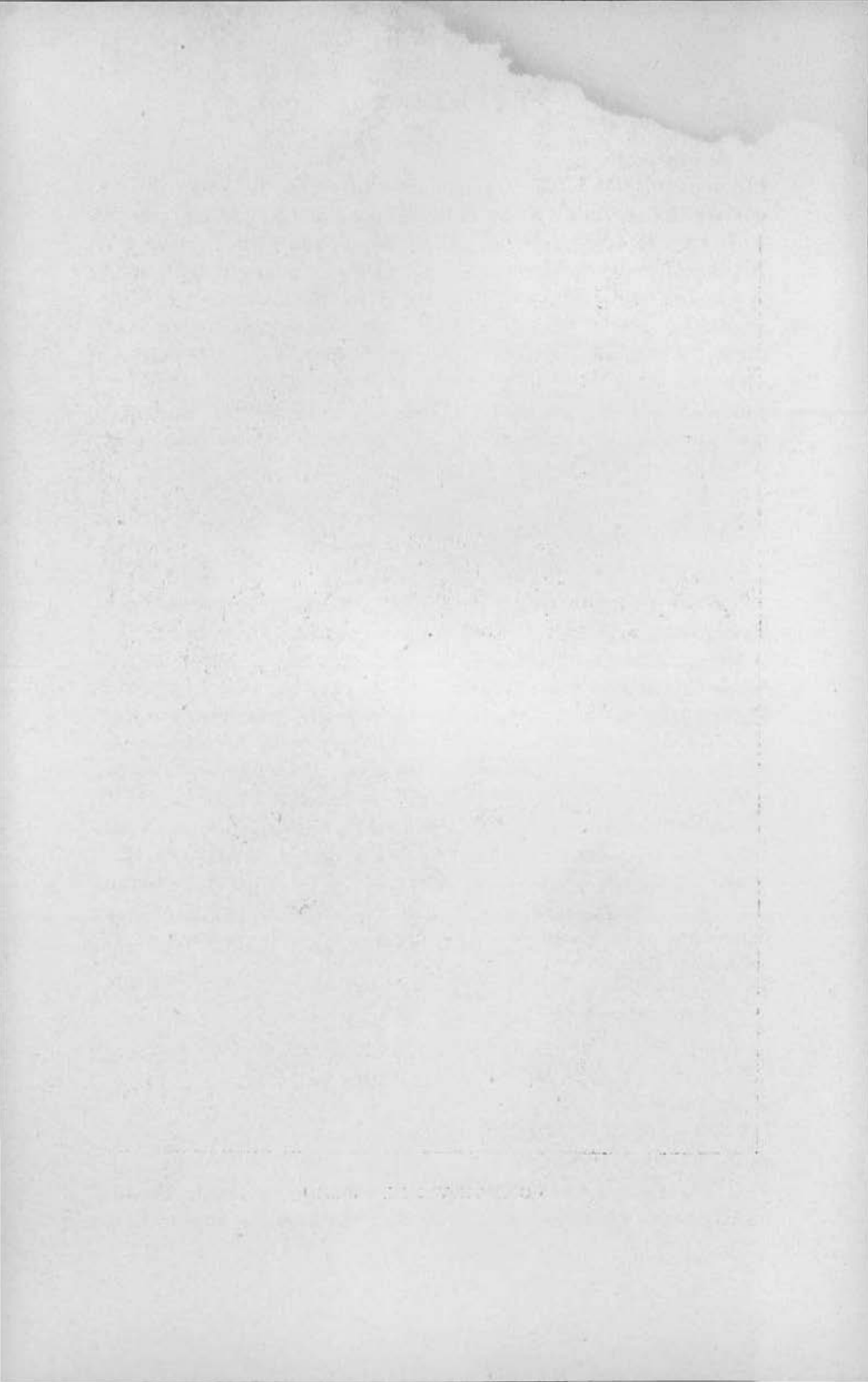
#### DESCRIPTION.

This grass resembles another species of wild barley, *Elymus Sitanion*, but a few words stating the differences will obviate the long and, to the majority of people, uninteresting if not incomprehensible description in scientific terms. The squirrel tail (*Hordeum jubatum*) grows in moist ground, is erect, and has a glistening appearance, the beauty of which is generally enhanced by a purple or red tinge. The wild barley (*Elymus Sitanion*) grows in dry ground, generally right amongst the sagebrush, it is more or less spreading or bent over to all sides of the

Plate XI.



COMMON TUMBLE-WEED.





clump, the spike is thicker and generally not so long, with a coarser appearance. This latter grass is not abundant enough to be serious, since it is not cut with hay, and while growing it is generally avoided by stock if they can get more inviting food. A practical description is therefore given when we say it is an annual, a foot to two feet high, sometimes growing in large clumps but often single-stemmed, the flowers in a two-sided spike about 4 inches long, the individuals of which are subtended by purplish or green, glistening beards or awns 2 inches in length and upwardly barbed. There are three florets at each joint of the spike-stem, the two lateral ones sterile and with short awns.

#### ERADICATION.

As there is practically no way to prevent the entrance of this weed onto the farm, our main attention must be directed to disposing of it as soon as it makes its appearance. Being an annual, if it be but occasionally found, it can be pulled up and burned before it ripens its seed. If, however, it be on the range, meadows, or fields in any great quantity, it can be combatted by an early mowing, followed if necessary by several subsequent mowings, and those while the heads are young. If these cuttings do not seem to eradicate it, and the ground is not too wet to be plowed, a surer way is to put in some crop that must be regularly plowed and hoed. This is in many meadows, over-wet from irrigation seepage, an impossibility, so that in such cases the only remedy is constant mowing and prevention of seed-maturing.

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#### COMMON TUMBLE WEED.

(*Amarantus albus*, L.)

This plant is so common everywhere in the west, that it hardly needs to be described. Its original home is supposed to

have been in tropical America. This is another of those plants the seeds of which are disseminated widely by the breaking-off of the plant and its being rolled along over the ground under the influence of heavy winds. It will grow in almost any soil, but luckily it cannot stand much shading or crowding, and so is an insignificant trouble in grain fields. It is especially abundant in poorly kept gardens, poorly tilled orchards, and in ordinary summer-fallow that is plowed early and not again disturbed till the the fall grain is sown. It is one of the surest signs of land improperly cared for, whether through the owner's laziness, or through the fault of plowing the summer-fallow too early and letting the land lie untilled late into the fall.

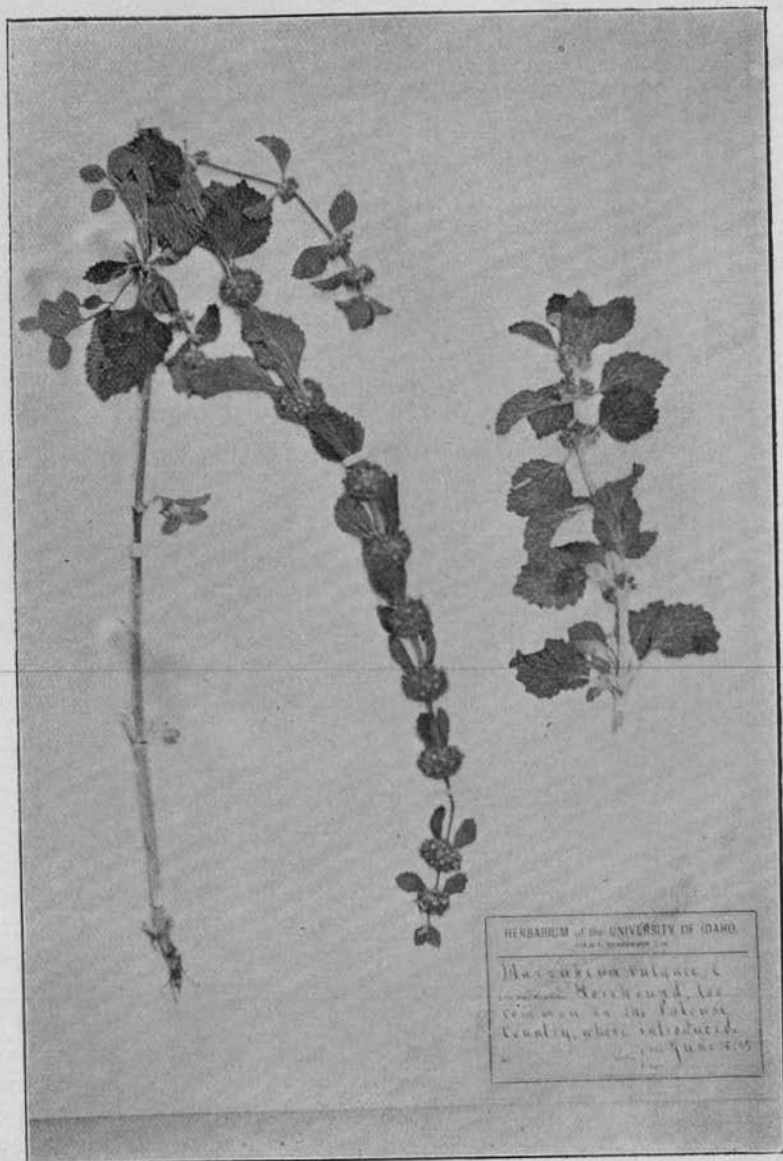
#### DESCRIPTION.

An annual, branching freely so that it assumes when fully grown, an egg or globular form. The plant is smooth, pale green with whitish stems, the leaves long-stalked, obovate or narrower, obtuse, and much smaller than are the leaves of the other species of this genus so commonly found in gardens, *Amarantus chlorostachys* and *A. retroflexus*. The flowers are crowded in close and small axillary clusters, and not on or near the end of the stem, as in the two others.

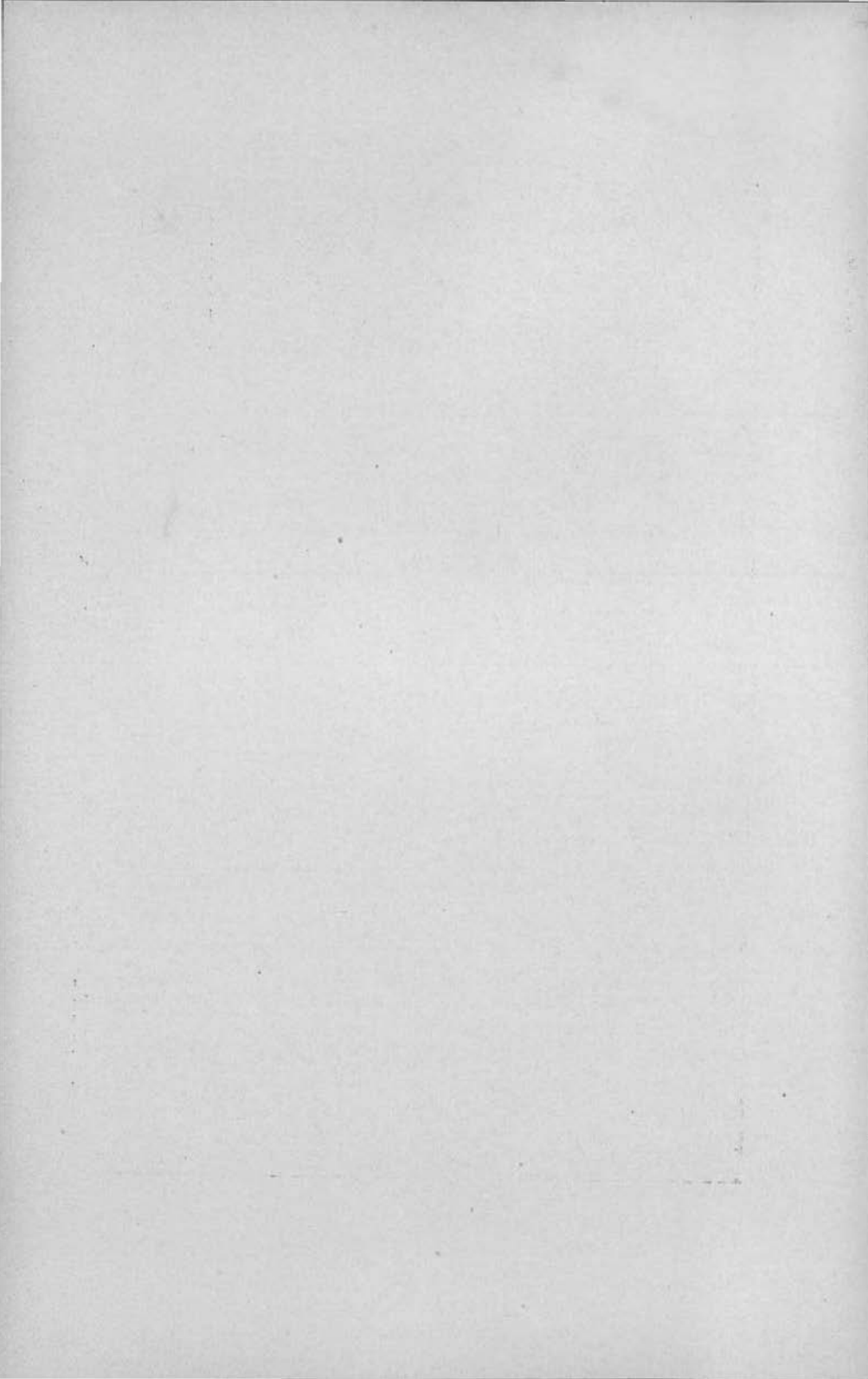
#### ERADICATION.

Prevention with this weed is an absolute impossibility. It remains then to deal with it when found. The constant struggle going on everywhere to overcome this species and the two others is too general even to need extended discussion. Common sense has everywhere shown that the price of immunity is constant handling of the plow, cultivator, and especially the hoe. In Northern Idaho, to the writer's personal knowledge, land that has been plowed and harrowed, and then hoed three times will, if allowed to remain untilled after the middle of July, still produce a crop of weeds. From fields seen near Moscow completely covered with tumble weed, it can also be stated that early plowing of summer-fallow, with nothing more done to the land till

Plate XII.



HOREHOUND.



the fall plowing and seeding commences, is but an open invitation to this plant to run riot over the land.

## HOREHOUND.

(*Marrubium vulgare*, L.)

It will perhaps be a surprise to some that this plant is placed amongst our worst weeds, and precedence be given it over such common pests as mustards, pig weeds, pepper grass, shepherd's purse, and a host of others. Yet such is the case. Everywhere in the Palouse country you find this plant well ensconced along the line-fences and invading wheat fields, oat fields, orchards, and gardens. Fields were noticed not many miles from Colfax, Washington, that had remained uncultivated for a few years. They were so completely overgrown with horehound that they had to be visited in order to ascertain whether it was weeds or some cultivated crop. Even about Moscow are to be found fertile fields planted regularly to wheat, and yet for a hundred yards from the fences they are thick with horehound, while scattered clumps are to be found all through them. Even our unplowed hillsides and pastures it takes possession of, and this at times almost to the exclusion of other plants.

### DESCRIPTION.

Perennial, about 2 feet high, with tap root, and short perennial branches near the ground which spread widely, the whole plant save the flowers covered with a white wool. The stems are somewhat square, the leaves opposite, round-ovate, stalked, and with scalloped margin. The flowers are crowded in capitate whorls in the axils of the leaves, the corolla small and white, the calyx becoming a bur from the hooks at the ends of its strong, slender lobes. This bur detaches itself readily when mature, and with the 4 inclosed seeds attaches itself easily to clothing or to the wool and hair of animals.

**ERADICATION.**

This is another plant that is well provided with means for dissemination. In the first place it has its heavy tap root, and secondly it has its abundant seeds, nearly all of which are fertile. That it is destined to become a pernicious weed is vouched for by the rapid way it has spread over the country since the advent of man. The best method to adopt for its destruction has not yet come under the observation of the writer. Undoubtedly the best, where the plant has but just begun to infest a field, is to dig it up and destroy it. Where, however, they occur in great numbers, as in some of our wheat fields, I can only suggest the same treatment as that already given for Canada thistle. In the future more definite information may be obtained as to the proper means of ridding a place of its very undesirable presence.

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**ACKNOWLEDGMENTS.**

This Station is under obligations to the Botanical Division of the U. S. Department of Agriculture as well as to several of the Experiment Stations for some of the figures and plates used in this Bulletin.

Figs. 1, 2, and 5 are from Farmers' Bulletin No. 28, U. S. Department of Agriculture.

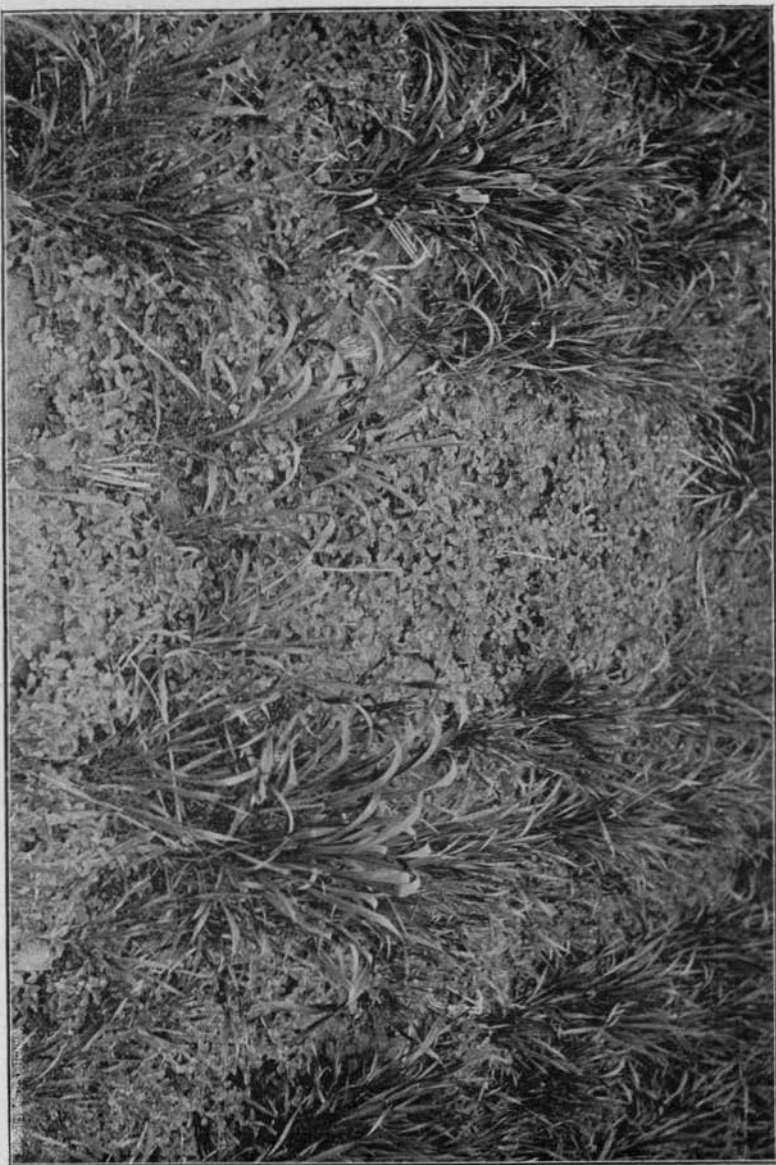
Figs. 3 and 4 are from Circular No. 7, Division of Botany, U. S. Department of Agriculture.

Plate IV is from Bulletin No. 15, Division of Botany, U. S. Department of Agriculture.

Plate V is from Bulletin No. 23, Colorado Agr. Ex. Station.

Plate X is from Bulletin No. 22, Nevada Agr. Ex. Station.

The other plates are from photographs taken by Prof. Fred. A. Huntley of the Idaho Agr. Ex. Station.



HOREHOUND IN WHEAT, NEAR MOSCOW.

