THE DAILY RECORD-UNION.

QUADRUPLE SHEET

AN ORCHARD PEST.

NATURAL HISTORY AND HABITS OF THE CODLING MOTH.

Successful Experiments for the Extermina tion of the Iusect-An Appeal to the Fruit-Growers of California.

To the fruit growers of California and all whom it may concern: It is unneces sary for our purpose to detail the amount of damage done the apple, pear and quince crop of central California since 1874, by the insect pest known as the codling or apple moth, as unfortunately it is too wel known. In June, 1877, we commenced our investigations to obtain reliable information of the natural history and habits of this pest of the orchard, and respectfully submit the result. The moth belongs to the family Tortrices, the worm the larva of the Carpocapsa Pomonella (the codling or apple moth). The moth passes the winter in the larva state, and, in some instances, in the chrysalis form. The larva can be found under the loose bark, in the crotches or indents or cracks in the bark of trees affected the previous year. The larva found in apples, pears and quinces are the same



Description of Figure 1. a.—Nest of larva as it appears on inside of bark then taken off tree. Color, drab.
b.—Pupa, or chrysalis. Color, dark amber.
c.—Appearance of larva when cover is removed off inter nest. Color, body yellowish white, head ark brown.

dark brown

d.—Appearance of bottom of winter nest on bark
when larva is removed following spring. We think
the larva obtains sustenance from the tree at some
time during the winter, as we have found the bottom of nest hollowed as d. Fig. 1; also signs of excrement in nest. In nests uncovered in January a
speck of what appeared to be of bark is frequently
seen in alimentary canal of larva, and, in specimens
kept, move through canal about one-eighth of an
inch in five days. inch in five days.

e.—A position the larva takes when looking for a

e.—A position the larva takes when looking for a tree or place to make its nest when ready to assume the pupa or chrysalis form. When the larva are full grown and ready to assume the pupa or chrysalis form, color light pink.
f.—The moth—first appearance as perfect insect; earries its wings like a steep roof.
g.—The moth with wings spread. Length of body, three-eighths of an inch; spread of wings, five-eighths of an inch (scant); color, body and legs rich bronzed drab, fore wings mottled dark drab with copper bar across hinder margin, color of hind wings plain drab. The moth, after depositing eggs, wings plain drab. The moth, after depositing eggs, has assumed a light drab color on fore wings and copper bar a very light color, scarcely perceptible, leaves. Do not think that the moth that produc the larva found on dried fruit and the codling moth are the same. That is a different species. Description—Length, half an inch; spread of wings, three-fourths of an inch; color, body dark drab, for wings, yellow bar one-eighth of an inch wide across shoulders, balance of fore wings mottled dark brown, carries wings roof-shaped, hind wings dark drab.

h.—Head of larva as seen through a glass magni-

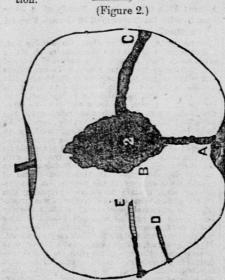
fying power nine times.

i.—In this figure we intended to represent the pupa or chrysalis case growing through nest prior to moth leaving it, but represented as larva to show better. The figure would be correct if the chrysalis (b) was represented instead of larva (c). The figures a, b, c, d, e and f are natural size, g is

The codling or apple moth passes the winter in the larva state generally, but in some cases, in the chrysalis form, can be found in nests made on the inside of the loose bark (a, Fig. 1), in the crotches or indents or cracks in the bark of apple, pear and quince trees which have been affected by this pest the previous season. They apparently prefer the quince and soft-barked apple trees to any other for winter We have found four hundred one apple tree, and could only find from crotches, or until it reaches a hiding three to six larvæ on pear trees in the place. If under the loose bark it comsay, was destroyed the previous season.

In an orchard near this city we found a number of chrysalids of this moth on a water-proof to a great extent. small, smooth-barked apple tree. Nests located in a warm spot. They apparently passed the winter as chrysalids. them on the 30th day of March. placed them under glass and applied artificial heat. Transformation in one case April 11th.

FIRST APPEARANCE OF THE MOTH. The moth generally appears from the 1st to the 20th of May; a few in favorable locations by April 25th. The time at which the eggs arrive at maturity apparently coincides with the end or termination of the pupa or chrysalis state, so that the sexes PROBABLE RATE OF INCREASE OF THESE are ready to unite soon after transforma-



Description of Figure 2.

A—Blossom end of apple, and where larva is sup-posed to enter the fruit.

B—Represents an empty space where carpellary ovarium or shell containing the seeds were located

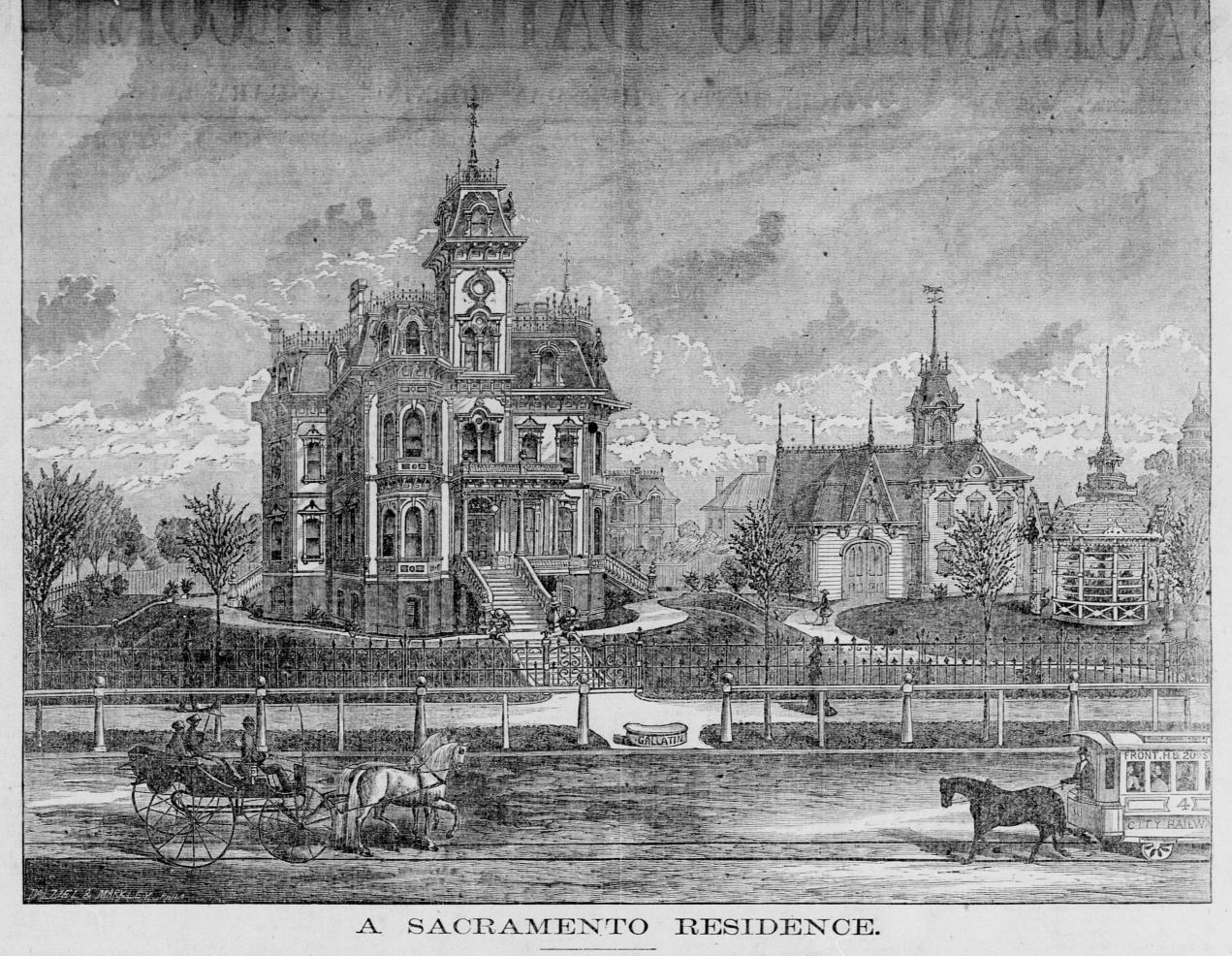
before the entrance of larva.

C—Represents the burrows made by the larva through the pericarp, by which it escapes from the fruit when it is ready to assume the pupa or chry-D-Appearance of larva in burrow when six days

E-Appearance of larva in burrow when ten days

The moth deposits the egg generally in the blossom end of the fruit (A, Fig. 2), but sometimes on any part (the latter especially late in the season). The eggs are attached to the fruit by a pasty substance. It is our opinion that at the time the egg is deposited the skin of the fruit is punctured, making easy entrance for the larva. It is rare to find more than one egg on any apple, pear, or quince, or more than one larva. The larva is hatched in from nine to twelve days, and begins to eat eagerly and burrow

of an inch under the surface of the apple. If our days, are the core of the apple. If our days or chrysalids of this preferable to cord, as they can be pressed into the dents care that the dents can be pressed into the dents can be pressed int cially late in the season). The eggs are attached to the fruit by a pasty substance.



We present herewith a very superior engraving, representing the elegant residence of Albert Gallatin, in the city of Sacramento. It is presented, not as the costliest, nor by any means the largest, but as one of the more recent of the many beautiful dwellings which grace this city. It is an admirable representative of a large number of attractive homes in this city, which are less spacious than its leading mansions, and more elaborate than the mass of the neat and tast ful residences of our citizens. The dwelling is located upon the south side of H street, corner of Fifteenth street. The view is one looking to the south, and gives a glimpse of the handsome Sacramento Grammar School building in the back ground, and the dome of the State Capitol upon the extreme west.

its journey can often be seen as e, Fig. 1. On reaching the tree, it searches for a nest-

were close to the ground. The tree was alis form from nine to twelve days, in this means, as they certainly make for the perfect moth appears (f, Fig. 1). It may be asked, "How does the moth get out of the nest so neatly made, etc.?" By some a candle. I know from visiting many took place April 5th, and in all before freak of nature, about twenty-four hours gardens about Hobert Town that some they will be near to the circles of the trees before transformation, the pupa is forced through one end of the nest (i, Fig. 1), so lost one-third of their crop of fruit this that the perfect insect can easily escape. year by the grub. I know one man who I The chrysalids of this moth are capable of moving lively at any time. From time to time they assume the chrysalis or pupa form until the insect escapes perfect.

MOTHS.

Entomologists claim that of the lepidopterous insects, including butterflies and moths, nearly one thousand kinds are known in the United States. That each female lays from 200 to 500 eggs. Taking female lays from 200 to 500 eggs. Taking 200 as the lowest number, twelve female moths in one orchard would produce 2,400 Now these are the kind of men that the caterpillars; if one-half these were females, industrious fruit-grower seeks protection they would produce 240,000. In proportion, the third generation would reach 24,-000,000. From the observations stated, we are led to believe that the destruction of this pest must be consummated while it is in the caterpillar state.

Is this pest of the orchard only found pest in the States east of the Rocky Mountains is too well known to need repeating. At the present time it is doing so much damage to the fruit crop in parts of Australia that a Commission has been appointed in Tasmania to investigate and report. | Town." (The report, if made, has not reached us) Sandy Bay, as reported to the Commission (taken from the Melbourne Australasian, July 12, 1879), allowance to be made as to dates for difference of seasons in Australia and California:

"I first observed affected apples in my garden early in January. I took the affected ones off and examined them minutely. At this time there was on some of the affected apples a red spot, with a brown speck in the center, which I supof an inch under the surface of the apple.

seed bag of fruit (B, Fig. 2); at twenty days, nearly full natural size (c, Fig. 1), showing clearly that the grubs will live by gnawing a hole through the pericarp (C, Fig. 2). Nature has supplied it with a sticking a gooseberry thorn in the apple spinneret, the opening apparently in the near the egg, and watched it until I cut lower lip, from which issues a viscid fluid the grub out full grown. I have not seen in a fine stream, and hardens into silk on any recent traces of the moth after about contact with the air. By this means it the middle of March, at which time we lowers itself to the ground or intervening had a little cold rain, which rain, I bebranches. If it reaches the ground it im- lieve, destroyed the grub in the apple by mediately crawls toward the tree, and on filling the holes with water. Pears and plums are also affected by the grub. I here beg leave to make a few suggestions. ing place under the loose bark in the lieve the present is a very good time for croches, or any cavity it can find. If it destroying the grub, as in many gardens comes in contact with a branch when leav- they can be found in great numbers under larvæ on one quince tree, two hundred on ing fruit, it generally crawls toward the the old bark that is on the trees. I have taken as many as twenty-seven from under the old bark of one tree, and I believe same orchard. The crop of all, we may mences building an oval-shaped wall, there were many other such trees in the about one-sixteenth of an inch high, com- garden. The old bark (every crack and If the spring is warm and favorable the posed of the viscid fluid from spinneret, crevice) should be searched for the grubs. larvæ are ready to assume the pupa or and sometimes mixed with pieces gnawed chrysalis form by the 15th of April. The off the bark; the cover is then put on the on the trees they should be taken off duration of the pupa or chrysalis state depends on external circumstances. If warm spring weather, the perfect insect may apin a crevice of the bark, the nest is made of the tree while the apples are pear in from fifteen to twenty days, and in different shapes. It is noticeable in the growing, at the hight of about one foot may be prolonged to twenty or thirty days. | winter nest the tops and sides are washed from the ground; the grubs will shelter in with fluid from spinneret, making the nest | the bands, which should be taken off every two or three weeks and burned. I believ The moth remains in the pupa or chrys- the grubs will be lessened very much by our usual May weather. At the proper tree for shelter. I believe it would be a time the pupa case is burst open, and the good way to burn naked lights on a fine

believe had fully one hundred bushels of apples destroyed by the grub; one half of these or more he gathered off the trees or the ground and threw them in the street, the remainder he put in a heap in an adjoining paddock. Now, this is not the way to keep the grub under. I asked another man why he did not get those grubby apples off the trees? He said: 'I don't keep them as a source of revenue.' Another man, in answer to a similar question, against. If the grub gets to the Huon, it

is my opinion the Huon people will never rid themselves of it." Thomas Johnson also writes to the Commission, giving a description of the larva, "With regard to the means and concludes: of destroying it I can offer no suggestion. in California? The damage done by this My attempt to catch the moths with a lantern, etc., was a failure, although there were hundreds of moths flying about. They have extended their circle very fast this last two years. I do not think eight miles would inclose them about Hobart

What remedies have been tried in Cali-For comparison, we give a written state-ment by Joseph Cronley of Lord street, 6, 1879, we recommended as the most confornia? In our pamphlet dated January venient a solution of sulphur and lime to wash the trees with. On application it was not as effectual as we could wish. It was not as enectual as would clean the tree; washed off all insect a package of paper.] life excepting the larva we wanted to destroy. It would not kill the larva of the codling moth, but would possibly prevent

it from assuming the pupa, A REMEDY FOUND.

With the assistance of David M. Dunne. will destroy the larva or chrysalids of this of them is preferable to cord, as they sity.

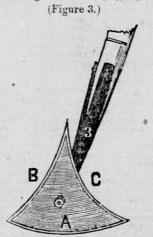
Fig. 2); at ten days, three-eighths of very often before the grub leaves labor. It will also take the united action with this solution. Where trees have been and often as large as e, Fig. 1.

When the larva is ready to assume the place. Then the moth does its work of dependence of the returns received were equal to 500 per done good service in the Eastern States.

ANOTHER PLAN FOR DESTROYING THE PES

HOW TO PREPARE THE WASH. Take ten pounds of the concentrated Washington Orchard, Yolo county, reready for use. (One pound of codling moth mixture to each gallon of water.)

PREPARING THE TREES. Immediately after the fall of the leaves, provide some small ship scrapers and grind two of the edges in circles (Fig. 3), so that



Use handles to suit. Procure a cloth made spread on ground around the tree as far as commence on the tree as high up as there contradiction, from Mr. B.'s orchard. is any rough loose bark, and scrape it carefully off. Also examine and scrape all crevices in the bark or those formed in the crotches of the tree. Continue scraping until you reach the ground. This done, gather the scrapings carefully off the cloth, so that they can be burned or destroyed. Be careful that you do not neglect gathering carefully the scrapings and destroying them, as on this point depends a great deal of your success. Take a common whitewash brush and give the tree a good coat of the whale-oil s sulphur solution, commencing at the top as far up as there are any cracks or crevices in the bark, and wash down to the ground. Repeat the washing before the spring; this will destroy any larva or chrysalis left on the tree. We have been informed by fruit-growers that they have found the larva in storerooms, boxes, etc., in the winter season. During the last two winters we have made very carful examinations of the fences,

shrubbery and packing-houses in some orchards, but failed to detect any larva of the codling moth. However, careful search washed with the above solution. writing the above we have found in a fruit packing-room some larvæ in nests made in FURTHER PRECAUTION.

ANOTHER PLAN FOR DESTROYING THE PEST.

wash and put in a barrel; on this pour two turned from the East last spring, it was gallons of boiling water, which will form a too late in the season to wash his extensive orchard, and only a small portion of it was natural size, is a mistake. cold water; stir and let stand twelve done. However, he was determined to hours (the longer the better; should be make an effort to clear his orchard of the stirred occasionally). The wash is then pest. He purchased three hundred hogs showing signs of the larva. The hogs fol- tured after the 20th of August deposit the and report results. We have nothing of

> up the fruit as it was thrown down. This operation was often repeated, so that the early broods were nearly destroyed. Regrowers having large orchards had the

destroyed. Any means taken to destroy the early destroyed. The work of exterminating this pest should be the united action of all fruit-growers having orchards affected by this pest. It matters not whether the orchards cover large or small tracts of land that was properly cleaned last spring, and the early crop saved from the ravages of this pest. Adjoining was an orchard owned by Mr. B., neglected in every way, men have lost one-half, and many have lost one-third of their crop of fruit this year by the grub. I know one man who I last twenty days of September threeof old sacks or any material convenient, fourths of them have been destroyed by this pest. Query: Where did they come the scrapings are likely to spread; then from? We will answer, without fear of

APPEAL TO FRUIT-GROWERS. To the enterprising and industrious fruit- varieties. growers of California: Permit us once more to warn you of the danger that threatens the products of your beautiful orchards. Organize a State society; make every effort in your power during the next two months to secure united action in your respective neighborhoods, for the purpose of exterminating the insect pest known as the codling or apple moth. If this fails, apply to the Legislature, which meets next January, and get a bill passed requiring every owner, lessee, renter, or occupant of lands on which there is planted or growing any apple, pear or quince trees, to un-caterpillar them by picking off and destroying, as prescribed in bill, all fruit affected or showing signs of larvæ. Also attaching penalties, etc.

The above may be considered a harsh ommendation, but what we know of the natural history and habits of this pest makes such a recommendation necessary.

We respectfully refer you to a sentence in the letter of Mr. Cronley to the Tasshould be made and every suspicious place manian Committee, which we will repeat: Now, these are the kind of men the dustrious fruit-grower seeks protection against." We are sorry to say, but it is nevertheless a fact, that there are many such men in Central California as there re-Take a piece of common straw wrapping paper, say twenty-four inches long and ten or twelve inches wide, double it length-wise (this will be sufficiently long for a tree seven inches in diameter—larger trees will seven inches a piece of common straw wrapping ments have brought us in contact with them. They will freely criticise all experiments made by others, but will be remarkably careful they do not try any themselves; and all the knowledge they ferred to by Mr. Cronley. Our experibrown speck in the center, which I supposed to be the egg; at this stage I could not find any grub. Next stage, a small hole covered with excrement, and I found the grub, but very small, about one-eighth the grub, but very small, about one-eighth the grub, but very small, about one-eighth the saving and saving in the saving and all the knowledge they require longer bands, in one or more claim to possess, their neighbor dare not know it. This class of men should be forced by the strong arm of the law to do the grub, but very small, about one-eighth will destroy the larva or chrysalids of them is preferable to cord, as they

When you find the larva, if it is not on and, to his surprise, two larva were found an inch, and about as thick as No. 20 wire the apple. The moth is a night of all fruit-growers in each neighborhood. washed, they have ascended and nested the loose bark, remove the piece of bark in one of his apple trees. (E, Fig. 2). It has burrowed by this time moth. I have seen them in an empty room No effort should be spared, as each year around the stems of the fruit hanging on to which it is attached; place it in a small wasting any time war was declared against about three fourths of the distance to the seed bag of fruit (B, Fig. 2); at twenty days, nearly full natural size (c, Fig. 1), showing clearly that the grubs will live seed by a few, in use for some time by parties in this summer time, inside of the pest. Washing done, early in the pest will be spreading further and between traps for them. The paper bands have been traps for them. and come to maturity in any sheltered place. Then the moth does its work of decent, on the outlay. What better investthe insect pests by experiments in this way. fight the pest. Mr. Saul evidently be-

When Charles W. Reed, proprietor of BRIEF MENTION. The theory that the moth deposited the Moral: "Go ye and do likewise."

lowed the men from tree to tree and picked egg that produce the larvæ and chrysalids the kind to sell; only wish to find the best.

last year. This plan is expensive, but it in contact with boxes containing wormy is a first-class remedy. Some other fruit fruit. We have taken six larvæ from one to any person applying by letter or otherbundle of empty boxes at the Sacramento wise. fruit showing signs of larvæ picked off and Valley Railroad depot, being sent back to the mountain orchards of El Dorado county. Of pear trees, from twelve to sixteen broods will prevent the late from being inches diameter, fair hight, one man washed one hundred and fifty per day. One gallon of solution averaged four and one-half trees. The codling moth wash is an excellent fertilizer for the tree, and produces a smooth

carefully, of the apple, pear and quince chard containing about seventy-five apple trees, some of them large trees. On fiftyeight that we examined carefully, we found, all told, three larvæ; on the fifty-ninth we found thirty-five in less than fifteen

minutes; on the balance we found only a Fart of the early fruit falls prematurely—when attacked by larve—but little of the late fruit falls before the larva escapes. Examine all boxes returned from market

before taking into the orchard. The codling moth wash can be bought in packages weighing from two pounds to two hundred and fifty pounds.

To be successful use every effort to de-

stroy the spring brood of moths. Fruit showing signs of larva should not be allowed to remain on the ground around

We have read statements by fruit-grow-

flying in large numbers. In our investigations we have not seen more than two at

We do not think the female moths can

Only united action of fruit-growers will gain a complete victory over this pest.

Defer not your action—the time arrives as soon as the leaves fall. AN ENTERPRISING FRUIT-GROWER.

The larva is hatched in from nine to twelve days, and begins to eat eagerly and burrow towards the carpellary ovarium, or core towards the carpellary ovarium, or core containing the seeds (B, Fig. 2).

The larva when hatched in from nine to twelve towards the carpellary ovarium, or core through the eye of towards the carpellary ovarium, or core towards the special part of the special part of the true will answer the same purpose, but may not be soeasily examined. Fig. 1. On removing cover off nest, it the apple a form the special part of the true will answer the same purpose, but may not be soeasily examined. Fig. 1. On removing cover off nest, it will also for the twe would also recommend that some the toward the cover in the same purpose, but may not be

lieves the old proverb, "An ounce of prevention is better than a pound of cure

egg on the fruit blossom, and that it re- Any person interested can have a packmained there until the fruit was grown to age of the codling moth wash, free of cost, to experiment on the codling moth, by ap-Supposing the moth matured from the winter larva on the first day of May, the street, San Francisco, by letter first brood of the season would reach per- or otherwise. All persons having any wash and put them in his orchard. He em- fection by the 20th of June, and the second or remedy for this pest, by sending us a ployed men to pick all fruit off his trees brood by the 12th of August. Those mapackage, we will have it thoroughly tested

for the next season.

Fruit-growers should examine all boxes mentioning names and localities-We have avoided, as much as possible, returned to their orchards. The pest has sults of experiments—but have in our possult: Mr. Reed shipped twenty-two car been spread over the country in return session abundant proof of the merits of loads of fruit East this year against five boxes from market, where they have been the remedies recommended. Any inform-

Proprietors Pioneer Box Factory, Sacramento. Sacramento, November 20, 1879.

"THE KNOW HOW."

Some time ago an anecdote appeared in —only united action will win the fight. In proof of this we will mention one instance. We know of an orchard owned by Mr. A. that was properly cleaned last spring. ment by washing their young vines twice and \$20 for his "know how." A subscriber each year, as we think that it will free signing "Welcome," writing from Little them from attacks of insect pests. R. B. River, Mendocino county, while admitting Blowers, of Woodland, Yolo county, indorses this plan for grape vines.

We have received a package of sheep wash from the Standard Soap Company of right, also to question the propriety of charging the right of professional men to make said the right of professional men to make San Francisco, which we will give a ing for the "know how," and opens the door thorough trial and report its effect on the which swings upon the rusty hinges of a very larva of this pest.

It is necessary where an examination is made of an orchard, to examine every tree less, and thus jocosely pitches into the physicians:

> I propose to stand up in favor of the unfor-We made an examination of a small orhard containing about seventy-five apple
> rees, some of them large trees. On fiftyight that we examined carefully, we found,
> ll told, three larvæ; on the fifty-ninth
> we found thirty-five in less than fifteen who is better posted give some good reasons why my friends, the M. D.'s, should have what some of us deem exorbitant prices for their "know how." I will cite a few instances which have come under my personal observation: A man who is compelled to labor twelve hours per day in a saw-mill for \$30 per month to support his family, was so unfortunate as to meet with an accident by which his hand was badly cut with a saw. Dr. Somebody was called to dress the wound. He came a distance of two miles, was one hour performing the operation and charged the sum of \$50—\$10 for the laber, and I sup-pose \$40 for the "know how." This young doctor came from the city only a few years since with nothing but his carpet-sack and his (diploma) "know how," and is now the owner of real estate, bonds, mortgages etc. ers that they have seen the codling moth dring in large numbers. In our investigation whose "know how" is almost infallible, was called to see a gentleman who was very low. In a very few moments the learned doctor prorong one time.
>
> The moth will live in glass seven days.
> The female moths deposit their brood of eggs within forty-eight hours.
>
> The egg can be seen plainly by the naked eye.
>
> The best time to see the moths at work is at dawn of day in the months of June and July.
>
> The experience of hundreds who have paid the hard-earned savings of years to noted M. Dearned savings of years to note M. Dearned savings of years to note of the patient beyond all help, with only one short week to remain with his friends. For this intormation and nothing else, his charge was only \$30.
>
> Yet, strange as it may seem, two years have passed away and the patient is alive to-day. The experience of hundred doctor pronounced his patient beyond all help, with only one short week to remain with his friends. For this intormation and nothing else, his charge was only \$30.
>
> Yet, strange as it may seem, two years have passed away and the patient is alive to-day. The experience of hundred doctor pronounced his patient beyond all help, with only one short week to remain with only one short week to rema D.'s, and many of whom have derived no benefit from "know hows," will be proof sufbe decoyed from the trees by burning lights at night in the orchard, until all the says: "Massa hab spend heap of money and says: "Massa hab spend heap of money and eggs in the ovary are deposited.
>
> In our experiments we found the female moths to be about forty per cent. of the number hatched.
>
> Says: "Anassa has spend nearly in mothy and great many years to get the know how."
>
> Does not the same argument apply equally as well to mechanics of all kinds? Many we know have spent years of hard labor under severe masters to learn their trades, and with many years of practice can obtain for their labor only the going wages, from \$2 to \$3 50 per day. Who ever heard of a carpenter charging \$5 for an hour's laber and \$20 more