

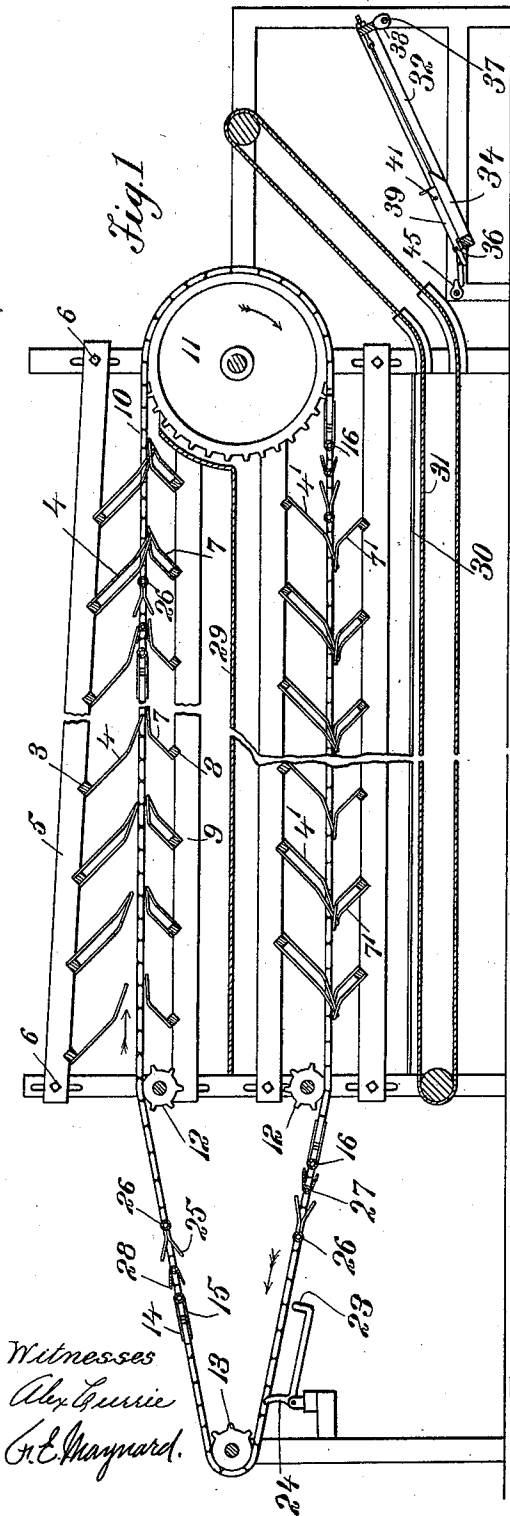
E. C. HORST.
HOP PICKER.

APPLICATION FILED JUNE 18, 1908.

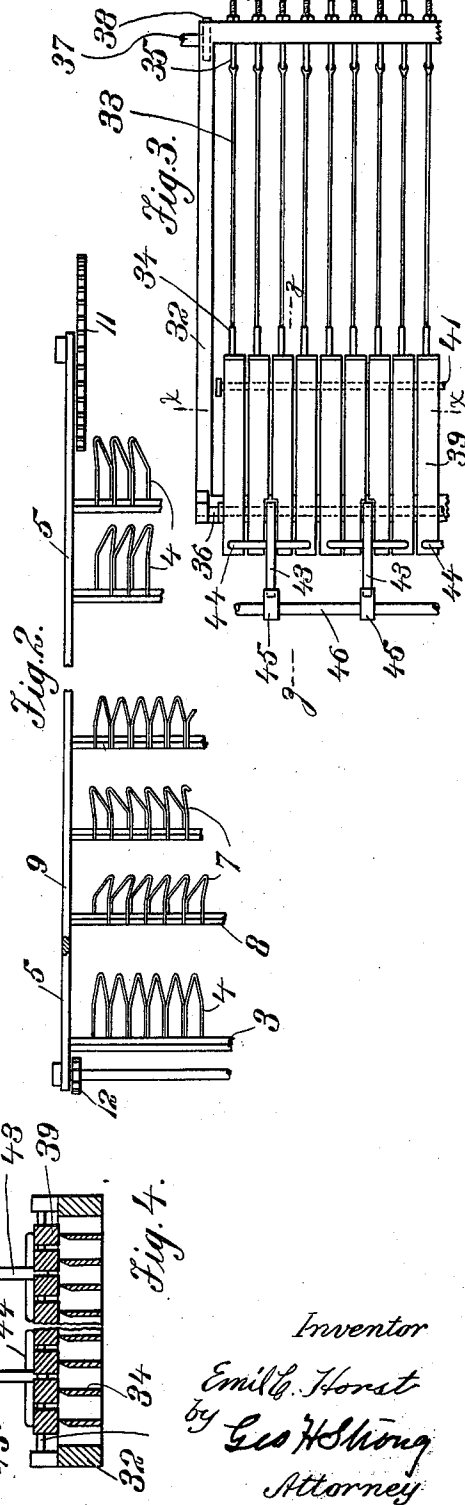
1,008,914.

Patented Nov. 14, 1911.

4 SHEETS—SHEET 1.



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4 SHEETS—SHEET 2.

Fig. 5.

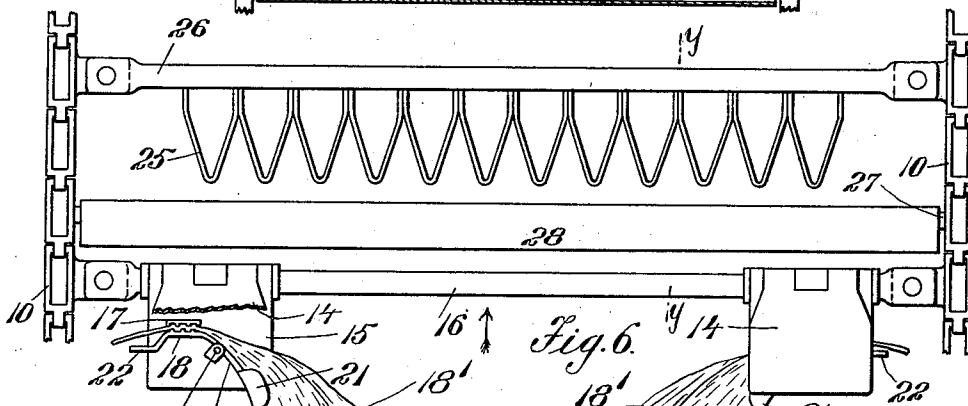
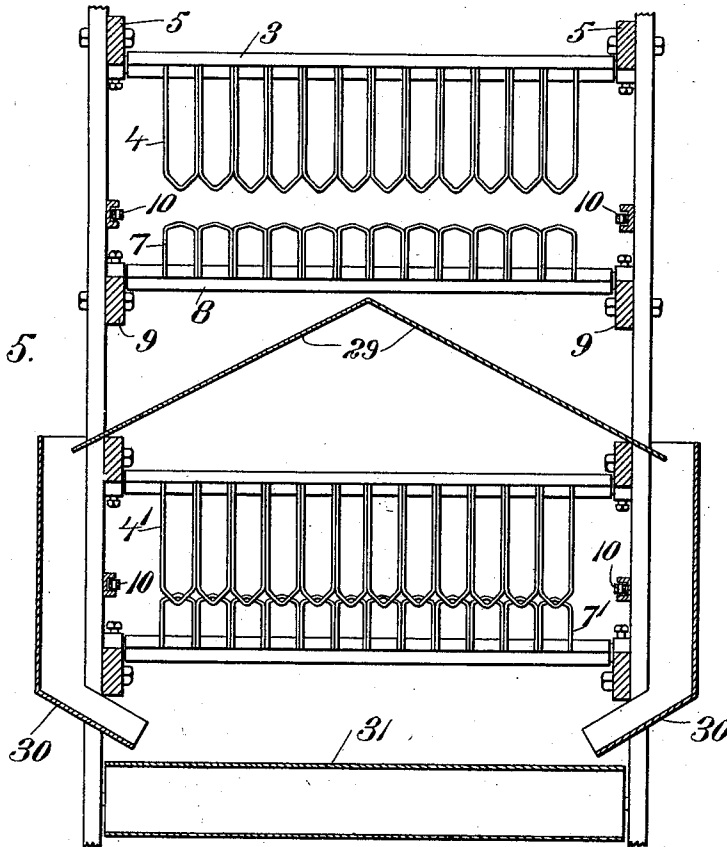


Fig. 6.

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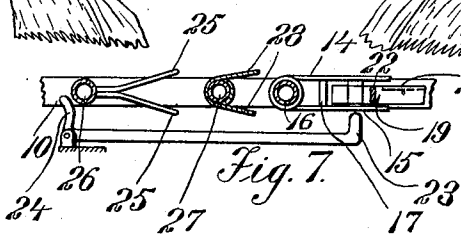


Fig. 7.

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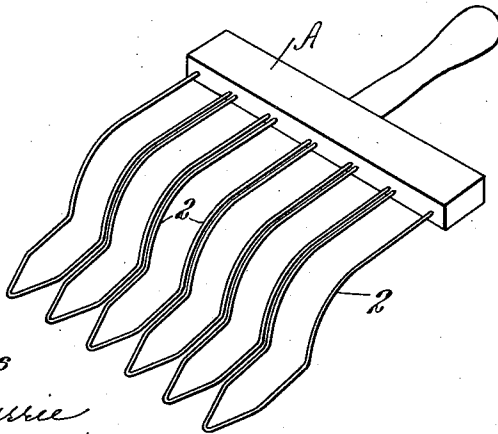
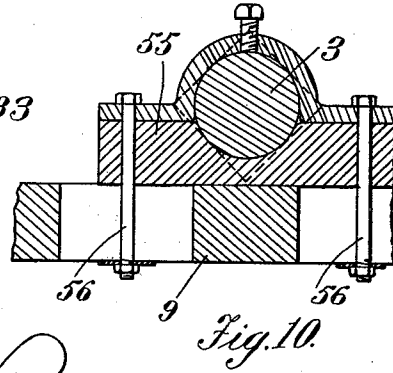
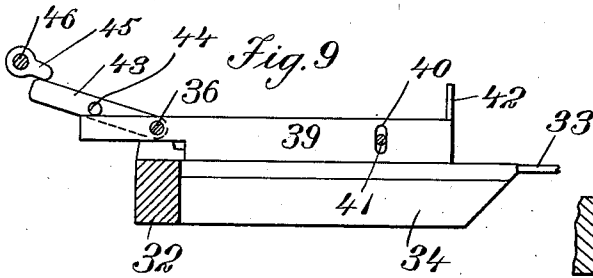
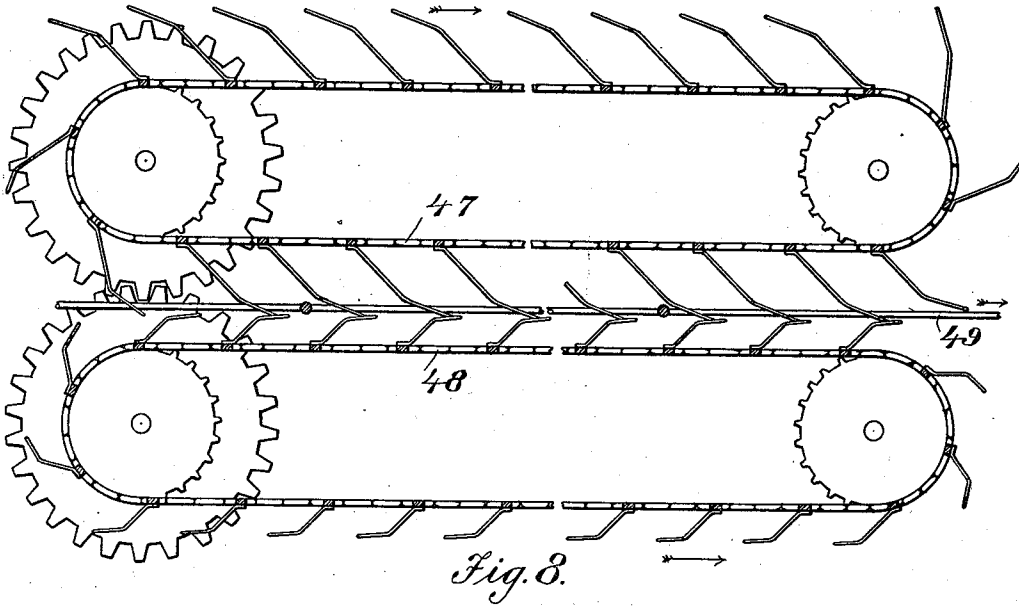
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4 SHEETS-SHEET 3.



Witnesses
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4 SHEETS—SHEET 4.

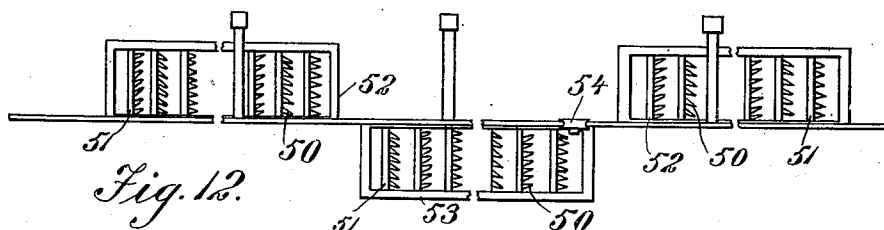


Fig. 12.

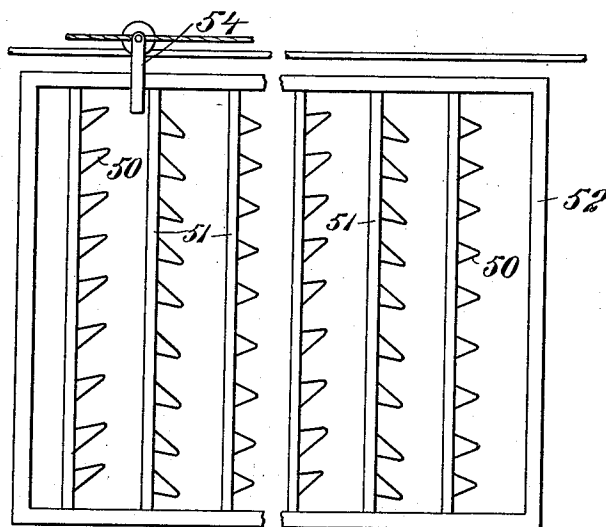


Fig. 13.

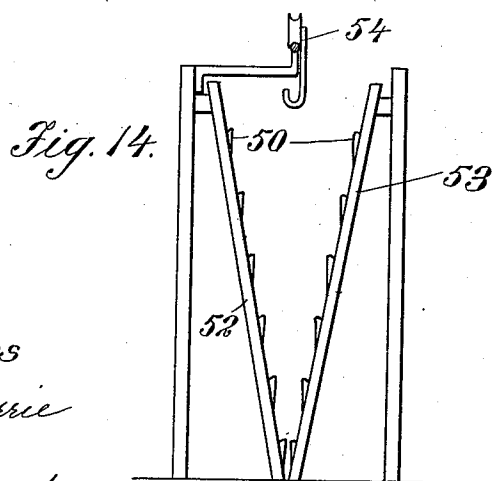


Fig. 14.

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UNITED STATES PATENT OFFICE.

EMIL CLEMENS HORST, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR TO E. CLEMENS HORST COMPANY, OF SAN FRANCISCO, CALIFORNIA, A CORPORATION OF NEW JERSEY.

HOP-PICKER.

1,008,914.

Specification of Letters Patent.

Patented Nov. 14, 1911.

Application filed June 18, 1908. Serial No. 439,112.

To all whom it may concern:

Be it known that I, EMIL CLEMENS HORST, citizen of the United States, residing in the city and county of San Francisco and State of California, have invented new and useful Improvements in Hop-Pickers, of which the following is a specification.

This invention relates to hop-pickers, or devices for removing the hops from the vines.

The invention is applicable either as a device for picking the hops by hand, or for picking them entirely by machinery; essentially the same principle being employed in either instance.

The invention consists of the parts and the construction and combination of parts as hereinafter more fully described and claimed, having reference to the accompanying drawings, in which—

Figure 1 is a longitudinal section of the invention. Fig. 2 is a plan view partly broken away of a portion thereof. Fig. 3 is an enlarged plan of the stem-severing device. Fig. 4 is a transverse section taken on line X—X, Fig. 3. Fig. 5 is a transverse section of the complete machine. Fig. 6 is a plan view of the picking, cleaning and vine-carrying devices. Fig. 7 is a section taken on line y—y, Fig. 6. Fig. 8 is a longitudinal section of a modification of the invention. Fig. 9 is a detail sectional view taken on line z—z, Fig. 3. Fig. 10 is a detail elevation of the means for allowing adjustment of the picker fingers. Fig. 11 is a detail perspective view of a hand-picking device. Fig. 12 is a plan of a modification. Fig. 13 is a side elevation of the same. Fig. 14 is a front elevation.

In the simplest form of the device, as shown in Fig. 11 for hand picking, A represents a bar or handle of suitable description, to which is secured any suitable number of curved and centrally bent spring picker members 2, preferably made of wire. These pickers are essentially A or V-shaped so as to inclose sharp crotches of any desired width, in which the hops are caught. These crotches or V-shaped loops, formed by suitably bending the wires in the manner shown and described, operate to engage the stems of the hops, and by a drawing motion either of the fruit against the device or the device against the hops, the hops and clus-

ters are easily and rapidly severed from the vines.

In Fig. 1, the same idea is carried forward into a machine in which any number of these pickers arranged in rows may be employed.

In the present instance, there is a series of upper cross-bars 3, each having its corresponding spring wire strippers or V-shaped pickers 4 similar to the picker members 2 first described. These upper series of bars are carried by the side bars 5, which latter are supported pivotally on to the machine frame, and are vertically adjustable at the ends, as shown at 6, to permit of a raising and lowering of the top series of pickers 4, with respect to a corresponding series of lower pickers 7. These lower pickers 7 are of similar construction to the upper pickers, and are carried by cross-bars 8 on the adjustable lower side bars 9. The cross-bars 3 and 8 are preferably adjustably secured to the respective longitudinal side bars 5—9 in such fashion that the bars 3—8 can be turned, more or less, to throw the upper and lower series of pickers more or less toward each other, and so vary the included angle, to effect the best results. Also, the finger bars 3 and 8 may be adjusted toward and from each other on the rails 5—9 by means of the blocks 55 in which the ends of the bars are supported; suitable means, as the bolts 56, working in slots in the side rails, serving to hold the blocks adjustably in position.

The machine may be of any desired length. In practice, it is usually made about forty feet long and about six feet wide.

Preferably the picking devices are arranged in deck formation, with a plurality of upper and lower series of pickers or fingers; the object being to cause the hop vines to turn over in their traverse through the machine, so that both sides of the hop vines will be twice or more acted upon, and the benefit be obtained of having the hops depend by gravity into the crotches of the underneath pickers. Thus below the set of pickers 4—7, I have shown a second set of reversely inclined pickers 4'—7'. Any appropriate means may be employed to draw the hop vines through the machine between the various banks or series of pickers. In the present instance I have shown a pair of

endless chains 10 passing over sprockets 11—12—13, and carrying suitable clamping devices arranged at appropriate intervals, by which the hop vines are gripped and drawn through the machine in the desired manner. Each of these gripping devices, as here shown, and as used in actual practice, comprises respective upper and lower hinged plates 14—15 pivotally hung on the cross-bars 16, which latter are carried by the chains 10 and are disposed at intervals at about twelve feet apart, more or less, according to the length of the hop vines. The underneath plate carries a fixed jaw member 17 and a movable jaw member 18; this movable jaw member 18 being part of a lever 19 which is fulcrumed at 20 to one side of the jaw 17. The end of the lever 19 adjacent to pivot 20 is toward the center of the machine, and is provided with an overlapping guard portion 21 underneath which the vines are laid and held in place. This lever 19 is curved backward away from the direction of travel of the carrier 10, and the arrangement of the jaws 17—18 is such that the jaws may be opened out to allow the insertion of a hop vine or a bunch of vines; and the moment that the carrier moves forward in the direction of the arrow, Fig. 7, the jaws will be automatically closed by the pressure of the vines 18' against lever 19 and underneath the guard plate 21. These grippers slide over the underneath pickers and are supported horizontally thereon, and the top cover plate 14, when closed down over the vines, prevents the ends of the stems or the grippers 17—18 from catching in the pickers. While the grippers with their load of vines are passing through the machine, the plates 14—15 will remain closed by the pressure exerted from the top and below by the pickers; but when the grippers issue from the machine, and at a point approximate to sprockets 13, the top plates 14 will drop down by gravity, and the outwardly projecting end 22 of the lever 19 will be tripped to allow the stripped vines to be discarded.

Any suitable form of tripping mechanism may be employed. As here shown, I pivot to any suitable support a tripping device having two angularly disposed arms 23—24, so positioned normally that when a cross-bar 26 carrying the clearing devices 25 comes along, this cross-bar, and the corresponding cross-bars 27—16, will miss the first finger 23, but bar 26 will strike the second finger 24, and so lift the finger 23 immediately into the path of the approaching end 22 of a movable jaw lever 19. As soon as the end 22 strikes the finger 23, the jaws open and release the stripped vines. As soon as the grippers have passed, the trip 23—24 drops down again into position ready for the next approaching gripper.

The parts 25—26—27 will be described shortly. The vines are inserted into the grippers as the latter re-approach the machine.

All the spring fingers or strippers in the machine point forward in the direction of travel of the carrier, and preferably the side bars 5—9 are inclined slightly toward each other away from the feed end of the device, thereby forming a more or less contracted space between the strippers or pickers, for the purpose of insuring the proper entry of the vines and hops into the machine. In practice, it has also been found advisable to make the top series of strippers or pickers longer and more springy than the cooperating lower set, and to have the A-shaped ends of the upper strippers intermeshing more or less with the underneath strippers. These pointed springy ends of the strippers or fingers will thereby press upon the vines yieldingly, and dig into the vines in such a way as to engage the maximum quantity of hops and produce a cleaner picking of the vines. Also, in order to enhance the efficiency of the machine it has been practical and advisable to vary the planes in which the pickers lie, so that not only the hops which stick up in the air and which hang downwardly will be caught and stripped from the vines, but also the hops which may stand out to either side will be likewise caught. Therefore, in the practical arrangement now employed, successive series of pickers will be arranged so that one set of pickers will have its picking ends lying substantially in a horizontal plane, or in the plane in which the vine travels. The next set will be turned to one side, as to the left, at an angle of 30° or 40°, more or less. The next series will be turned similarly to the right, while the series next succeeding will be more nearly horizontal, like the first, and so on progressively through the machine. These pickers which are turned to one side or the other may be designated as diagonal, or laterally-inclined pickers, or right and left pickers; while the others may be called the flat or horizontal pickers. This arrangement of pickers is illustrated in Figs. 1 and 2, and it is understood that the upper and lower pickers of a set correspond. That is to say, there is an underneath horizontal picker for each upper horizontal picker, and there is a corresponding lower left picker for each upper right picker, and so on; the intermeshing pickers having their picking ends lying in planes which converge toward the point of the pickers, so as to insure the proper leading of the hops into the pickers. The long top spring fingers or strippers yield sufficiently to allow the hop vines to pass, and without injuring the fruit.

In order to clear the fingers of hops which

might otherwise stick in the crotches of the V-shaped ends, I employ wire clearing devices, as 25, carried on the cross-bars 26 arranged a suitable distance, usually about a foot, in advance of the gripper-carrying bars 16. These clearing and cleaning devices 25 are preferably made of spring wire, and are also V-shaped at the ends and bent upward and downward so as to present cleaning members adapted to engage both the upper and lower sets of pickers 4-7 and 4'-7'. These cleaning devices 25 will spread the pickers apart, reaching into the crotches of the pickers and pulling out the hops, and on releasing the pickers will allow them to spring back and shake off anything that might otherwise adhere to them.

In order to prevent the fingers from becoming gummed and clogged up as they will otherwise do, I arrange a cross-bar 27 between each pair of bars 16 and 26, and wrap this bar with felt, soft leather, or other suitable absorbent material, leaving a couple of flaps 28 to be saturated with oil, and to act as wipers for the stripping fingers or pickers. By this oiling arrangement it has been found that the strippers keep clean and bright, allowing the severed hops to fall freely away from the fingers, when cut off.

It is manifest that instead of the hops traveling between relatively fixed sets of stripping fingers or pickers, as above described, these stripping fingers may be mounted on upper and lower sets of endless carriers 47-48, as shown in Fig. 8, and the hops may be drawn between the adjacent parallel planes of the carriers 47-48 by any suitable means, as the cable 49; the two carriers 47-48 being so timed to travel in unison that there will be intermeshing or cooperating sets of upper and lower pickers, similarly as hereinbefore described.

The hops which are taken off by the strippers in the first traverse of the vines through the machine fall onto the inclined plates 29, and roll thence off to either side, where they are caught by inwardly inclined plates 30 and directed in underneath the lowermost series of strippers on to the draper 31, whence the hops and clusters are carried to one end of the machine and deposited on to the separating screen. This separating screen preferably consists of an inclined frame 32, to the head end of which are anchored the separating wires 33. The lower ends of these wires connect with metal plates 34 arranged on edge, Figs. 3, 4 and 9. Suitable tensioning devices, as 35, are employed, by which the wires may be maintained taut.

The lower end of the screen frame 32 is pivoted on a shaft 36, while the upper end is given a vibrating motion by any appropriate means, as the shaft 37 and cam 38, so as to cause the blossoms and clusters to

either go through between the wires and edgewise standing plates 34, or, in the case of clusters, cause the clusters which straddle the wires to slide down the wires on to the sharp edged plates 34 and beneath the pivoted bars 39 when the latter are raised.

The bars 39 rest flat on the sharp edges of the plates 34 and are individually fulcrumed on the shaft 36 on which the frame 32 is hung. There is a separate bar 39 for each plate 34, and each bar has a limited rocking movement independent of all the other bars, provided for by the elongated slots 40 and loose connected rod 41 extending through all the bars. The clusters which straddle the wires and slide down on to the cutting plates 34, strike against the front end of the bars 39 when they are down, and are prevented from rolling on over the bars by a shield 42 carried by each bar. When the bar is lifted these clusters can slide on down the plates underneath the bars, so that when the bars drop again they will coact with the plates 34 to sever the stems and allow the blossoms and fruit to pass down through. Any appropriate means may be employed to oscillate the bars 39. As here shown, a series of levers 43 are fulcrumed to the shaft 36, each lever carrying a cross-arm 44 extending over one or more of the bars 39, and each lever 43 acted on by respective cams 45 on a shaft 46. Any appropriate form of driving connections may be employed to give constant motion to the shafts 37 and 46, and the various other moving and operating parts of the apparatus. If desired, a plurality of these separating screens 32 may be employed, one arranged beneath the other; but for the purpose of the invention it is only necessary here to show one.

In practice, the operation of the apparatus is as follows: The various pickers and strippers 4-7 in the several series are first properly adjusted according to the fullness and character of the vines and hops being treated. The vines are gripped between the plates 14-15, and the conveyer 10 set in operation. The vines are thereupon drawn between the pickers, and the hops removed in the manner previously described. These V-shaped pickers operate in the manner of combs, in the angle portions of which the stems of the hops are caught and the hops stripped off. While many of the hops are caught by an upper layer of pickers, most of the hops, since they are connected by their slender stems to the vines, more easily fall into the crotches of the underneath pickers, and are thereby removed; hence the object of turning over the vines and causing them to travel through the machine in a direction reverse to that first taken. When the vines have thus two or more times traversed the length of the machine, they are

discharged by reason of the arm 22 on the movable jaw 18 striking the stop 24 and opening the jaws, whereupon the pressure on the vines being released, results in the vines dropping off clear of the machine. The severed hops and clusters falling on the conveyer 31 are deposited on the inclined shaking screen 32; and such clusters as may straddle the wires 33 or plates 34 are severed from their stems by means of the cutters 39, as previously described.

In Figs. 12, 13 and 14, is shown a modification of the invention, in which the picking fingers 50 are arranged on upright bars 51 arranged in panels 52—53, which panels are shown as arranged in succession and oppositely inclined. The hop vines are suitably supported from an overhead trolley carrier 54, and these vines hang down so that when they are drawn across or between the panels 52—53 the hops will catch in the picker fingers 50 and be stripped from the vines. Instead of arranging the panels alternately inclined, and in succession, as here shown, they may be arranged side by side so as to inclose a V-shaped space between them, and the hops will be drawn through this gap or chasm formed between the panels. As the hops are drawn along they are turned over and revolved, so that all the hops on the vines will surely be caught in the fingers.

Having thus described my invention, what I claim and desire to secure by Letters Patent is—

1. In a machine for removing hops from vines consisting in the combination of a V-shaped member open at the front, with the apex of the V permanently closed, a hop vine carrier disposed with relation to the picker so that the vines and hops are made to traverse said picker, and a hop vine grasper on the carrier.

2. In a machine for removing hops from vines, the combination of inclined springy V-shaped members having a suitable support, and a hop vine carrier having means for holding the hop vines and arranged and constructed to drag the hop vines across the carrier to cause the hops to engage in the springy V-shaped members.

3. In a hop-picker, a series of lower V-shaped strippers, and a cooperating upper series of V-shaped strippers inclined toward the lower series the apex of each V-shaped member being closed.

4. In a hop-picker, a lower series of V-shaped picking members, and an upper series of springy cooperating V-shaped pickers, said upper and lower series of pickers including an angular space between which the hop vines are adapted to be passed the apex of each V-shaped member being closed.

5. In a hop-picker, successively arranged series of lower V-shaped pickers, corresponding successively arranged upper series of V-

shaped pickers, said upper and lower series of pickers including angular spaces between which the hop vines are adapted to be passed the apex of each V-shaped member being closed.

6. In a hop-picker, successively arranged series of lower V-shaped pickers, corresponding successively arranged upper series of V-shaped pickers, said upper and lower series of pickers including angular spaces between which the hop vines are adapted to be passed, and means for causing the hop vines to traverse the strippers the apex of each V-shaped member closed.

7. In a hop-picker, successively arranged series of lower V-shaped pickers, corresponding successively arranged upper series of V-shaped pickers, said upper and lower series of pickers including angular spaces between which the hop vines are adapted to be passed, the V-shaped portions of certain of said upper and lower strippers being arranged diagonally with respect to the planes of other of said strippers.

8. In a hop-picker, successively arranged upper and lower cooperating series of V-shaped pickers, the succeeding series of upper and lower pickers being at different inclines, whereby one cooperating set of upper and lower pickers will have its picking portions approximately horizontal, and a succeeding set of cooperating upper and lower pickers will have its picking portions diagonally inclined.

9. In a hop-picker, successively arranged upper and lower cooperating series of V-shaped pickers, said cooperating series of pickers being arranged to act successively on the top and bottom of the vines and on the sides of the vines.

10. In a hop-picker, the combination of cooperating upper and lower sets of pickers inclined toward each other, means for varying the inclination of the pickers toward each other, and means for causing the hop vines to traverse the pickers.

11. In a hop-picker, a series of lower pickers, a cooperating series of upper pickers, said pickers inclined toward each other, and means for adjusting one series of pickers toward and from the other series.

12. In a hop-picker, the combination of upper and lower cooperating series of inclined V-shaped pickers, a hop vine carrier traversing the space between said pickers, and hop vine gripping means on said carrier.

13. In a hop-picker, the combination of upper and lower cooperating series of inclined V-shaped pickers, a hop vine carrier traversing the space between said pickers, and hop vine gripping means on said carrier, said gripping means comprising upper and lower hinged plates, and grip members carried by the plates.

14. In a hop-picker, the combination of

upper and lower coöperating series of inclined V-shaped pickers, a hop vine carrier traversing the space between said pickers, hop vine gripping means on said carrier, 5 said gripping means comprising upper and lower hinged plates, a fixed jaw member between the plates, and a movable jaw member pivoted to one of the plates and coöperating with the fixed jaw member, and means 10 operative by the vines gripped by said jaws for automatically holding the jaws closed.

15 15. In a hop-picker, the combination of upper and lower coöperating series of inclined V-shaped pickers, a hop vine carrier traversing the space between said pickers, hop vine gripping means on said carrier, 20 said gripping means comprising upper and lower hinged plates, a fixed jaw member between the plates and a movable jaw member pivoted to one of the plates and coöperating with the fixed jaw member, means operative by the vines gripped by said jaws for 25 automatically holding the jaws closed, and means for automatically tripping the jaws to release the vines.

16. In a hop-picker, the combination with an endless carrier, of a gripping device thereon comprising a pair of hinged plates, a fixed jaw between the plates, a lever pivoted between the plates and having a jaw 30 portion coöperating with said fixed jaw, and said lever having one end operative on by the hop vines automatically to close the jaws.

35 17. In a hop-picker, the combination with an endless carrier, of a gripping device thereon comprising a pair of hinged plates, a fixed jaw between the plates, a lever pivoted between the plates and having a jaw 40 portion coöperating with said fixed jaw, said lever having one end operative on by the hop vines automatically to close the jaws, the other end of said lever having a projection, and a stop engageable with said projecting end to open the jaws. 45

18. In a hop-picker, the combination of upper and lower series of coöperating V-shaped pickers, a hop vine carrier traversing the space between said pickers, and cleaning 50 devices on the carrier engaging the crotches in the upper and lower series of pickers.

19. In a hop-picker, the combination of upper and lower series of coöperating V-shaped pickers, a hop vine carrier traversing 55 the space between said pickers, and cleaning devices on the carrier engaging the crotches in the upper and lower series of pickers, said cleaning devices comprising upper and lower V-shaped members.

20. In a hop-picker, the combination of upper and lower series of coöperating V-shaped pickers, a hop vine carrier traversing the space between the pickers, and an 60 oiling device on the carrier engageable with the pickers to oil and clean the pickers.

21. In a hop-picker, the combination of upper and lower series of coöperating spring wire V-shaped pickers, an endless hop vine carrier traversing the space between said pickers, said carrier having hop vine grippers, and V-shaped cleaners for the pickers 70 on the carrier in advance of the grippers.

22. In a hop-picker, the combination of upper and lower series of coöperating spring wire V-shaped pickers, an endless hop vine 75 carrier traversing the space between said pickers, said carrier having hop vine grippers, V-shaped cleaners for the pickers on the carrier in advance of the grippers, and oiling devices on the carrier intermediate of 80 said cleaners and grippers to oil and clean the pickers.

23. In a machine for removing hops from vines, the combination of a series of crotched members, the walls of the crotch of each 85 member being united at the apex of the crotch so as to close the crotch opening at the apex, said crotch members having individual spring supports disposed in an angle to the planes of the crotches and a 90 hop vine carrier with means for holding the hop vines so that as the carrier moves the hops are permitted to engage in the crotches of said members and be pulled from the vines by the coaction of the carrier and the 95 crotched members.

24. In a hop-picker, a combination of opposed series of individually-mounted, spring-supported, V-shaped combing devices between which the hop vines are made to 100 travel, means for conveying the hops between these combing devices, and said combing devices operative to strip the hops from the vines.

25. In a hop-picker, a combination of 105 upper and lower series of combing devices between which the hop vines are made to travel, means for conveying the hops between these combing devices, said combing devices operative to strip the hops from the 110 vines, and means for varying the space between the upper and lower combing devices.

26. In a hop-picking apparatus, the combination of a series of individually-mounted, springy stripping devices having V-shaped 115 notches or crotches in which the stems of the hops are caught, and means for causing the hop vines to traverse these stripping devices.

27. In a hop-picking apparatus, the combination of opposed coöperating series of 120 stripping devices, said stripping devices of springy material, and having V-shaped crotches in which the hops are engaged the apex of each V-shaped member closed. 125

28. In a hop-picking apparatus, the combination of opposed coöperating series of stripping devices, said stripping devices of springy material and having V-shaped 130 crotches in which the hops are engaged, and

conveying means for the hop vines traversable between said series of strippers.

29. In a hop-picking apparatus, the combination of upper and lower cooperating series of stripping devices, said stripping devices of springy material and having V-shaped crotches in which the hops are engaged, and conveying means for the hop vines traversable between said series of strippers, said conveying means comprising an endless carrier having clamping devices for engaging the hop vines.

30. In a hop-picking apparatus, the combination of upper and lower cooperating series of stripping devices, said stripping devices of springy material and having V-shaped crotches in which the hops are engaged, conveying means for the hop vines traversable between said series of strippers, said conveying means comprising an endless carrier having clamping devices for engaging the hop vines, and means for automatically releasing the stripped hop vines from said clamping devices.

31. In a hop-picker, the combination with means for removing the hops and clusters from the vines, of a separating apparatus comprising an inclined screen composed in part of separated plates stood on edge, between which the hops singly may pass, and devices cooperating with said plates to sever the hop stems of the clusters which may straddle the plates and allow the hops to pass through between the plates.

32. In a hop-picker, the combination of upper and lower spaced side rails, cross-bars carried by said side rails, V-shaped spring pickers carried by said bars, and means for adjusting said cross-bars toward and from each other.

33. In a hop-picking machine, the combination of upper and lower spaced side rails, means for adjusting them toward and from each other, cross-bars carried by said rails, V-shaped spring pickers carried by said cross-bars, and means for adjusting the cross-bars toward and from each other lengthwise of the rails.

34. In a hop-picking machine, the combination of upper and lower spaced side rails, means for adjusting them toward and from each other, cross-bars carried by said rails, V-shaped spring pickers carried by said cross-bars, and means for adjusting the cross-bars toward and from each other

lengthwise of the rails, said cross-bars turnable to adjust the upper and lower cooperating pickers toward and from each other.

35. A hop picking device consisting of resiliently yieldable members forming intervening V-shaped spaces permanently closed at the apex and open at the front.

36. A hop-picker comprising a V-shaped member open at the front and closed at the apex, with the open end of the V guarded, and means for causing the hop vine to traverse the picker and to lead the hops into the guarded end of the V-opening.

37. A V-shaped hop-picker closed at the apex of the V and open at the heel end and supported from the heel end, said heel support forming a guard to the hops entering at the heel end, and means for causing the hop vines to traverse the picker to engage the hops in said V-opening.

38. A hop-picker consisting of a suitably supported member having a V-shaped opening, the walls of said opening united at the apex, guard members in continuation of the heel end of the V whereby the hops are led smoothly into the V-opening, and means for conveying the hop vines to lead the hops into said V-opening.

39. The combination in a hop picking machine of a hop vine carrier comprising a pair of spaced, parallel, endless chains or equivalents, connected at intervals by cross-bars whereby the vines are allowed to trail out behind and between and parallel with the chains, and a successive series of hop picking devices arranged transverse to the travel of the carrier and in the path of travel of the vines carried by the carrier and said hop picking devices comprising suitably supported members having each a V-shaped opening, the walls of said opening united at the apex and guard members in continuation of the heel end of the V and the open end of the V disposed toward the approaching hop vines on the carrier, said guards operative to lead the hops smoothly into the V openings.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

EMIL CLEMENS HORST.

Witnesses:

HENRY P. TRICOU,
B. E. MURRAY.