May 29, 1928. 1,671,101

F. L. CROCKETT

COMBING MACHINE

Filed Dec. 29, 1924 6 Sheets-Sheet 1

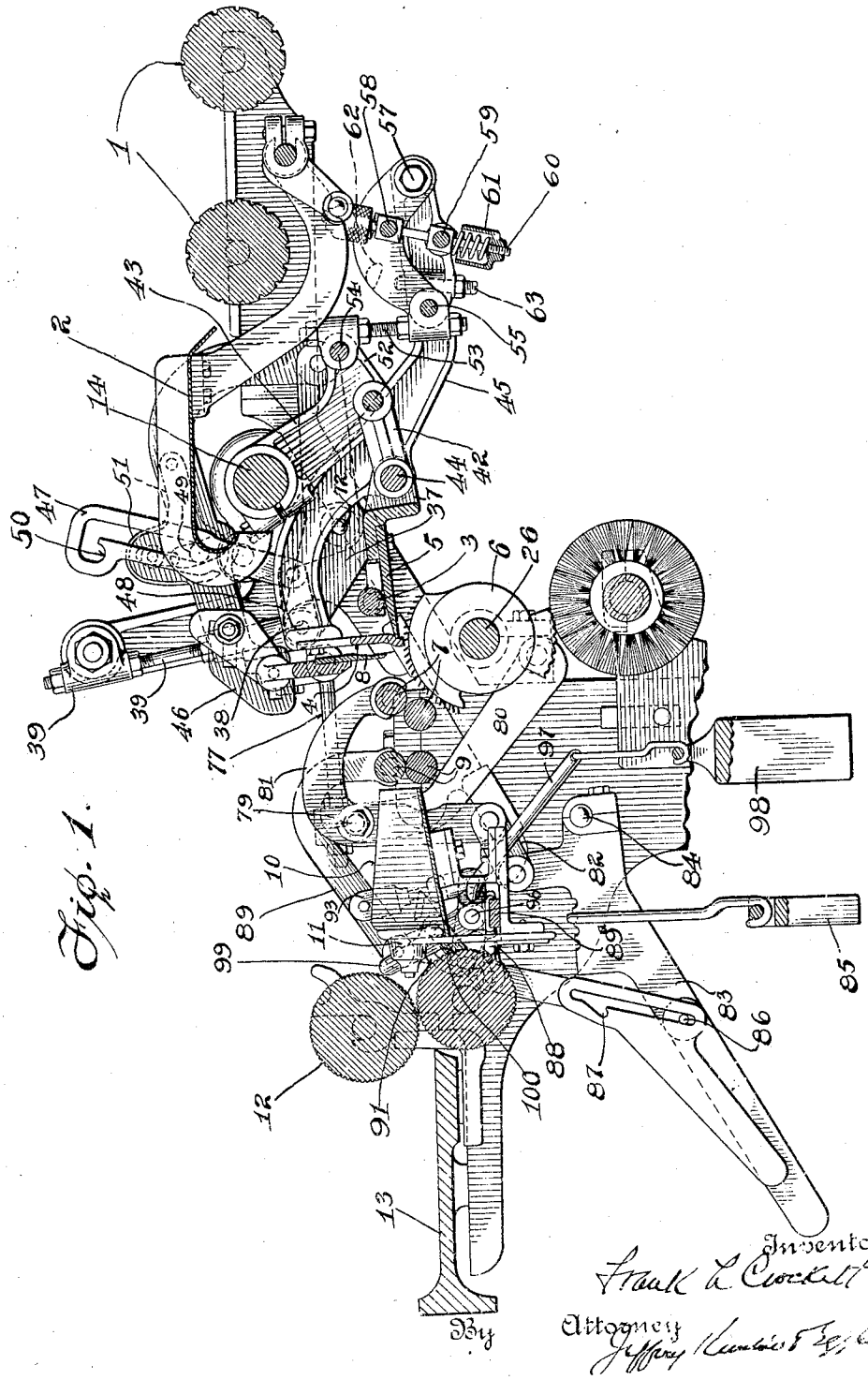


Fig. 1.

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May 29, 1928. 1,671,101

F. L. CROCKETT

COMBING MACHINE

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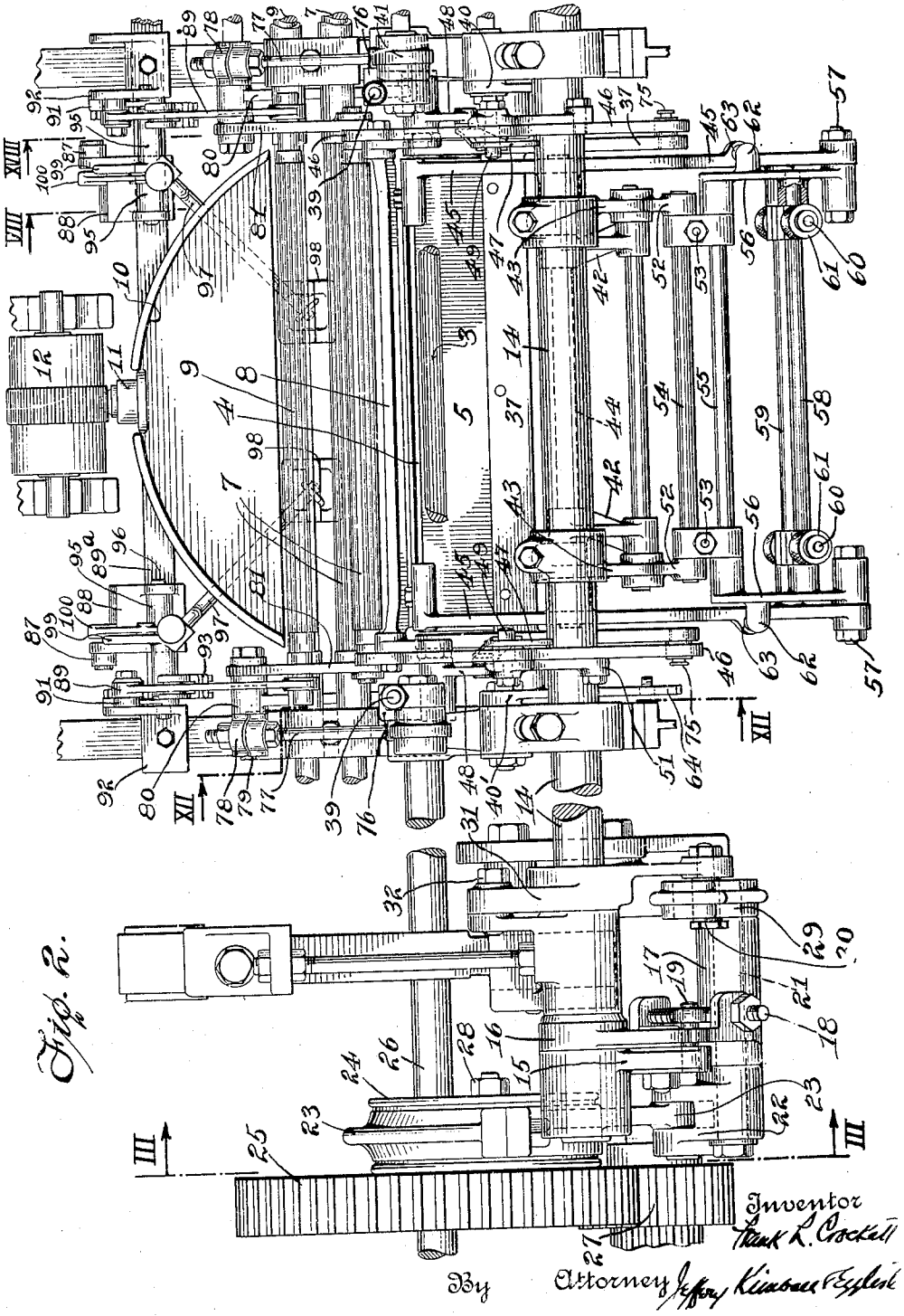


Fig. 2.

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May 29, 1928. 1,671,101

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COMBING MACHINE

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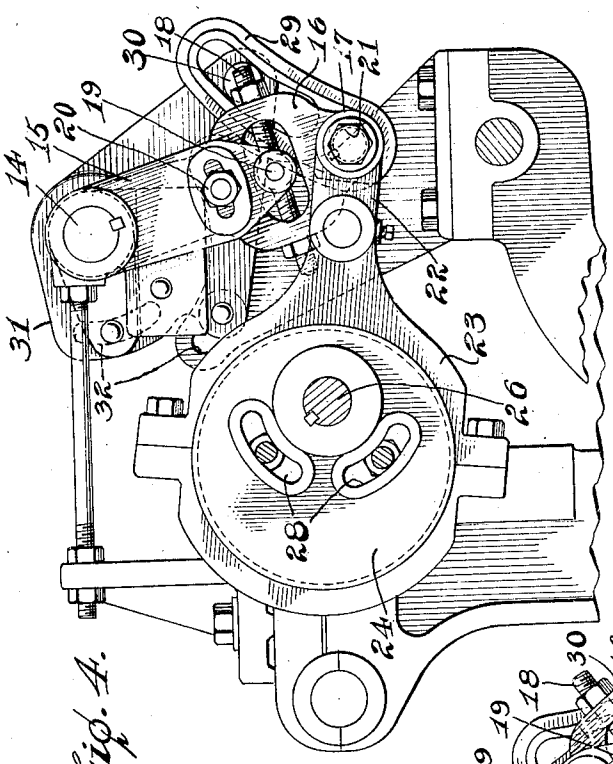


Fig. 4.

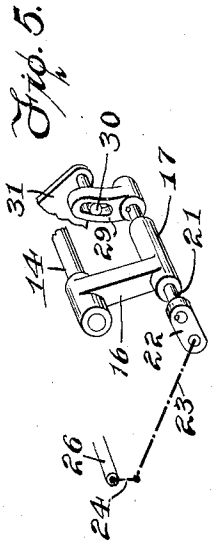


Fig. 5.

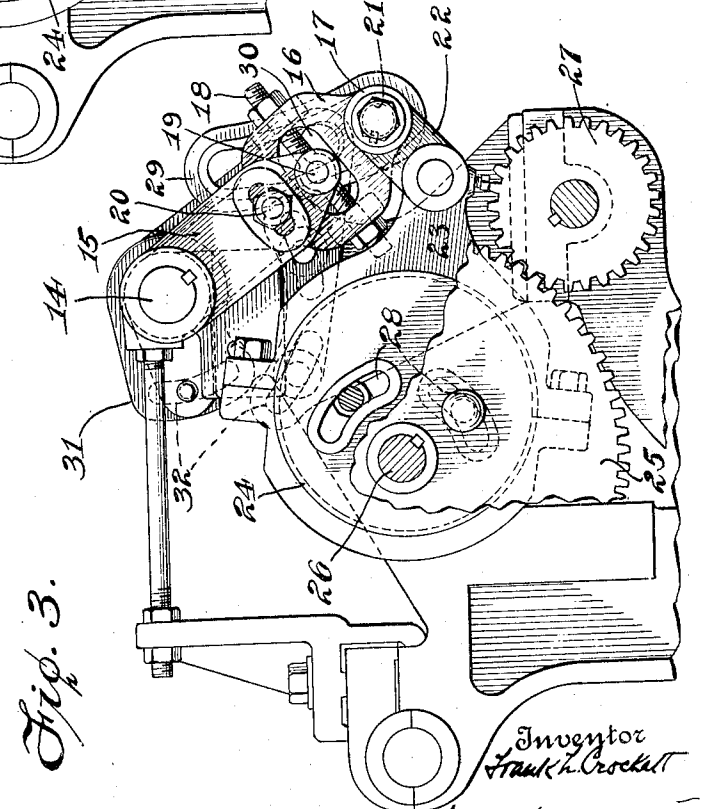


Fig. 3.

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May 29, 1928. 1,671,101

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COMBING MACHINE

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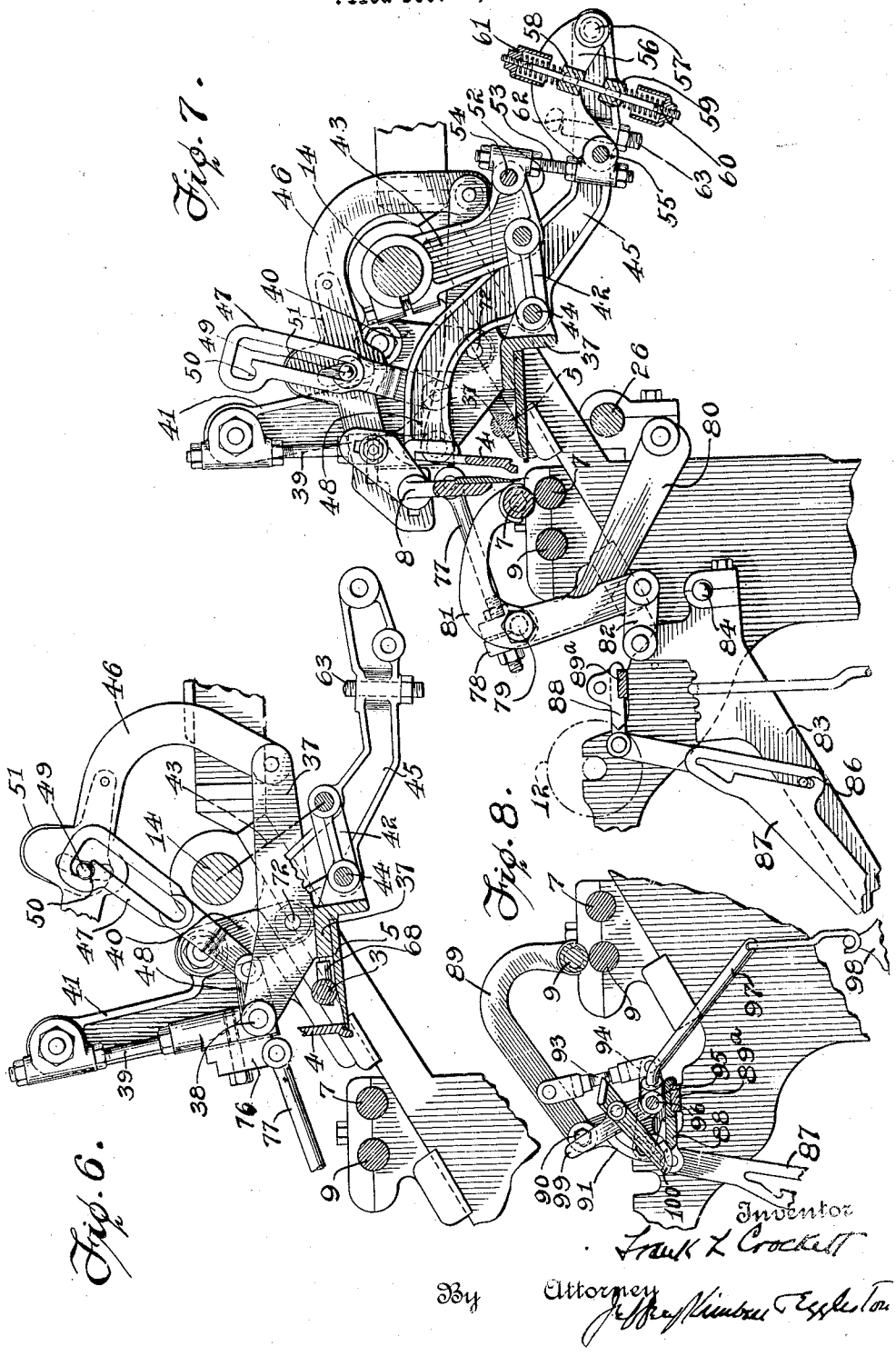


Fig. 6.

Fig. 7.

Fig. 8.

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May 29, 1928. 1,671,101

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COMBING MACHINE

Filed Dec. 29, 1924 6 Sheets-Sheet 5

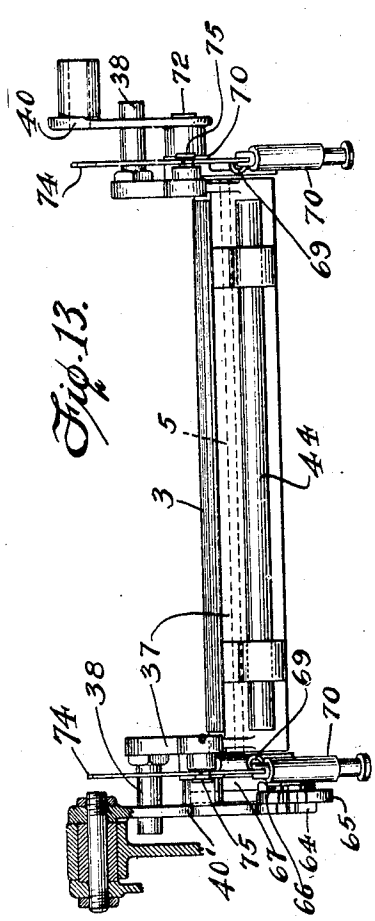


Fig. 13.

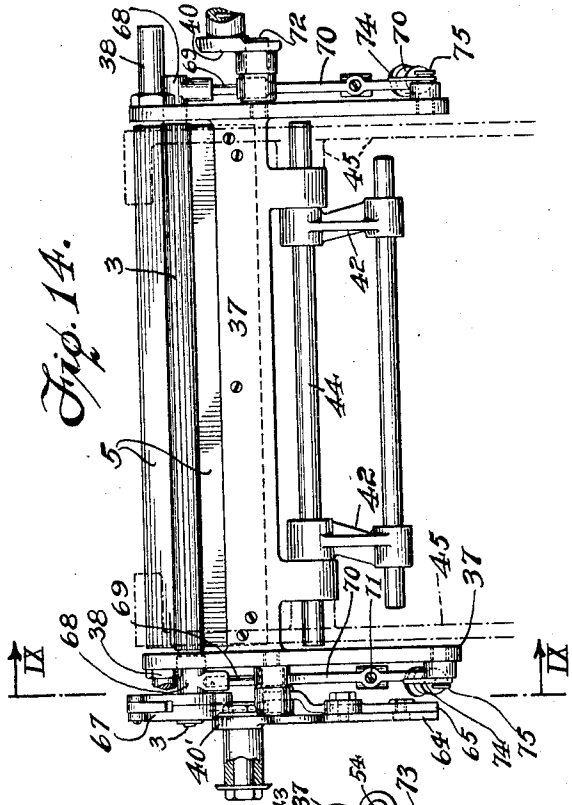


Fig. 14.

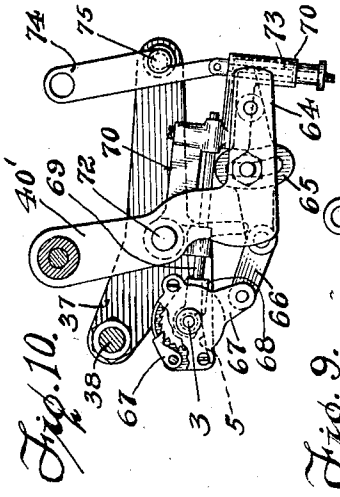


Fig. 10.

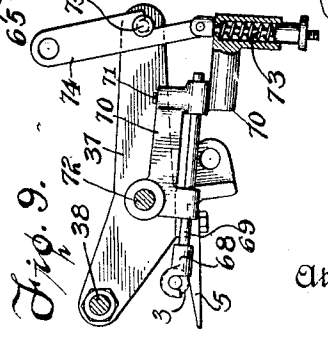


Fig. 9.

Fig. 12.

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May 29, 1928. 1,671,101

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COMBING MACHINE

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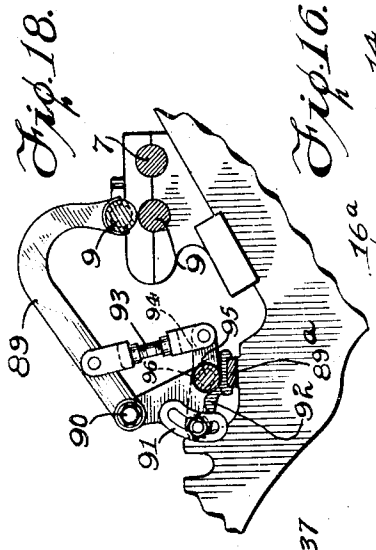


Fig. 18.

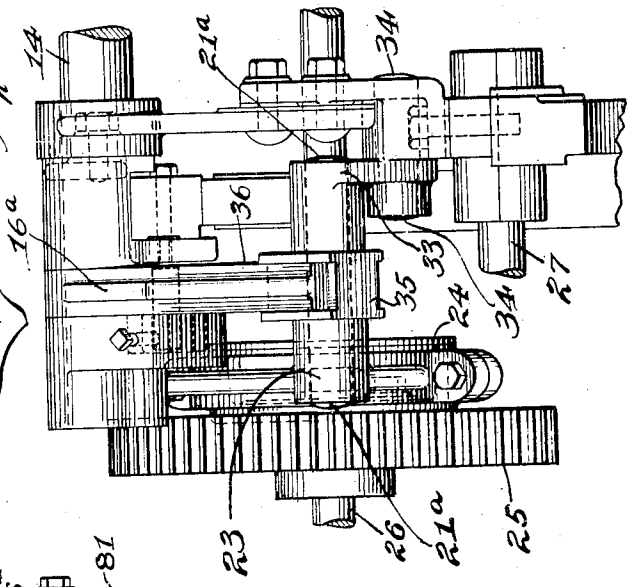


Fig. 16.

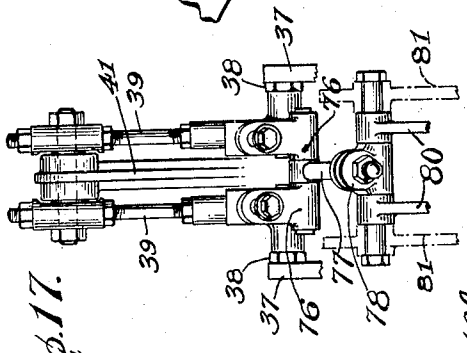


Fig. 17.

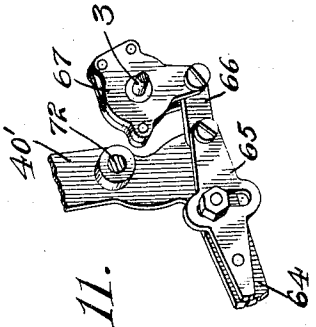


Fig. 11.

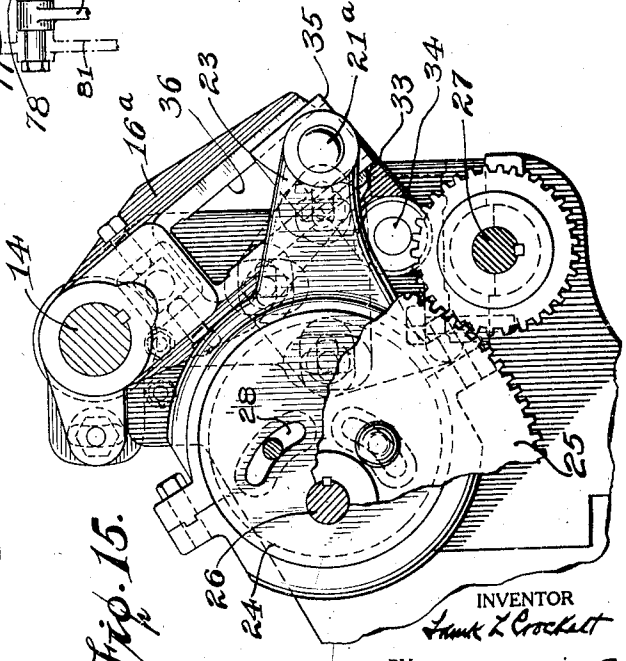


Fig. 15.

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UNITED STATES PATENT OFFICE.

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COMBING MACHINE.

Application filed December 29, 1924. Serial No. 758,516.

The invention improves the efficiency and rate of production of combing machines of the so-called Heilman type and comprehends various combinations and relations of parts as hereinafter described and which are herein shown as combined in a single cotton comber, but which may be separately employed in various relations in existing or other types of combers as will hereinafter become apparent.

In the drawings, Figure 1 is a general vertical section through one of the combing heads of a cotton-combing machine embodying my invention; this view illustrates the relation of the various centers and general mode of operation, but, for sake of clearness, omits various of the necessary parts and appurtenances common to these machines.

Figure 2 is a top plan of a part of the drive head and one of the combing heads, with the lap plate removed from the latter.

Figure 3 is a section on line III—III of Fig. 2 of the drive head mechanism.

Figure 4 is the same view with the parts in a different position.

Fig. 5 is a perspective diagram illustrating the motion obtained in the mechanism of Figs. 3 and 4.

Fig. 6 is a vertical section through a combing head with parts broken away to show the mode of suspension of the nipper frame, the top comb arms being indicated in the elevated position and broken off and the nipper frame being shown in its rear or combing position.

Fig. 7 is a cross section through the nipper frame in its forward or detaching position.

Fig. 8 is a vertical section on line VIII of Fig. 2, illustrating the weight-relieving system of the front detaching rolls.

Fig. 9 is a detail illustrating the holder and pressure mechanism for the lap feed roll.

Fig. 10 is a similar detail illustrating the lap feed roll drive mechanism.

Fig. 11 a perspective detail of the lap-feed adjustment.

Fig. 12 is a detail section on line XII—XII of Fig. 2.

Fig. 13 is a rear elevation of the nipper frame and certain related parts.

Fig. 14 is a plan view of the nipper frame and related parts.

Figs. 15 and 16 are respectively cross section and rear elevation of a modified and preferred form of mechanism for actuating the main rock shaft.

Fig. 17 is a detail front elevation of the connection between the nipper frame and piecing mechanism; and

Fig. 18 is a section on line XVIII of Fig. 2.

In the present comber, as in others of the same type, a lap of fibre or cotton is fed from the creel rollers 1 (Fig. 1) over the lap plate 2, to the lap feed roll 3 and thence into the bite of the nipper jaws 4 and 5 by which its projecting end is first presented to the action of the combing needles on the rotary comb cylinder 6, and then to the bite of the detaching and piecing rolls 7, wherein the forward end of the combed tuft is overlapped on the tail end of the last preceding tuft. On the forward motion of the detaching rolls the tuft is drawn from the nipper jaws and through the top comb 8 which has been lowered for the purpose, being thereby detached from the lap. From the detaching rolls the pieced sliver advances through the front rolls 9 into and through the sliver pan 10 and its trumpet 11 and thence through the calendar rolls 12 onto the sliver apron or table 13 on which it is drawn lengthwise of the comber to the draw head, not shown, at the end of the latter. The detaching and piecing rolls periodically reverse their motion for the purpose of presenting the tail ends of each successively combed tuft in position to be overlapped with the head end of the next following tuft, as will be understood by those skilled in this art.

Appropriate motion is imparted to the various members of the combing head, just referred to, from mechanism constituting the drive-head at the end of the machine, and by means of several longitudinal shafts which extend through and are common to all of the comber heads, of which there may be six or more, as desired. Of this drive-head mechanism only those parts are illustrated in the drawing which are concerned with the operation and adjustment of the longitudinal rock shaft 14 which is the member which actuates the nipper frame and its associated parts. All the other parts may be constructed and organized

according to the established principles of drive-head design and as will be understood.

The rock shaft 14 extends from the drive-head through all the comber heads, being journalled in the intermediate frame uprights which separate the comber head spaces. At its drive head end this shaft is provided with a stub arm 15 keyed thereto and the adjacent crank arm 16 which is mounted free on shaft 14 is adjustably bolted to the stub. At its outer end the crank arm 16 carries the bearing 17 of a shaft 21 presently referred to. The adjustment between the stub 15 and its crank arm 16 is represented by the double-ended eye-bolt 18 carried on the latter and the eye of which is engaged to a pin 19 fixed in the end of the stub, and also by the arc slot and set bolt 20 which serve to secure the adjustment, as will be apparent. By means of these adjustments the shaft bearing 17, on the end of the crank arm 16, can be set in the desired angular relation to the rock shaft 14 and the various comber head parts operated by the latter; the limits of the movements of said parts can be thereby simultaneously and equally altered. The specific design of these adjustments, however, is not important and can obviously be substituted by other equivalent adjustment mechanism.

One end of the shaft 21, which is journalled in the bearing 17 on the end of the crank arm 16, is connected by a crank arm 22, fixed thereon, to the eccentric strap 23 of an eccentric 24 which latter is adjustably secured by bolts to the side of the main comb shaft, or "index" gear 25. This gear drives the comb cylinder shaft 26 on which all the comb cylinders 6 are mounted and is itself driven by a drive pinion 27 representing the source of power for the machine. The adjustment between the eccentric and the index gear is by means of the arcuate slots 28 (Figs. 3 and 4) and the purpose of the adjustment is to set the operation of the nipper and feed mechanism in proper timing with the comb cylinders and detaching motion, as will presently appear.

The motion imparted to the shaft 21 by the eccentric is controlled by the slotted crank arm 29 fixed on the opposite end of said shaft. The slot in crank arm 29 engages and rides on a fixed stud 30 mounted in a bracket 31 which is adjustably supported on the comber frame by means of the bolts and arcuate slots marked 32 in Fig. 3, so that the position of the stud can be changed. As the eccentric rocks the shaft 21, the rotary motion of the latter, in its bearing 17, is restrained by the stud and slot so that some of the motion is converted into lateral movement of the shaft with consequent movement of the rock shaft 14 by which it is carried. The simple crank motion of the eccentric is thus modified, in its transmission to the rock shaft 14, by the shaft 21 and the character of the motion of rock shaft 14 is determined by the curvature of the slot in the crank arm 29 and the position of the fixed stud 30 which is adjustable, as stated, so that such movement can be controlled as desired.

Substantially the same kind of motion can likewise be imparted to the rock shaft 14 by the organization shown in Figures 15 and 16 which is preferred because of its greater simplicity. In these figures the shaft 21^a, corresponding to shaft 21, is carried in the end of a link 33 swinging on a fixed axis 34 and is journalled in a slipper block 35 and in the end of the eccentric rod 23 from which it receives lateral motion. The slipper block slides back and forth in the fork slot 36 of the crank arm 16^a on the rock shaft 14. This crank arm corresponds to arm 16 in the form first described and is also angularly adjustable on the shaft by means which will be understood without description. In this case the shaft 21^a and its appurtenant parts represent the means for modifying the crank motion of the eccentric as imparted to the main rock shaft.

The rock shaft 14 actuates the nipper mechanism, as presently explained and the purpose of the modified crank motions just described is to cause the nipper to have a greater dwell while in their retracted or combing position, so that all the rows of needles on the comb cylinders may have maximum action on the tuft. A similar motion might be obtained by means of a cam, but the type of mechanism above described is preferred because of its smoothness and quietness of operation and the use of such mechanism constitutes one of the important features of this invention.

Referring now to the combing heads, all the principal parts of each head, including the top comb, are organized in and carried by the nipper frame, and according to this invention the latter is supported by front and rear links, so that it partakes of something of a parallel motion as it moves toward and from the detaching rolls. Preferably it is suspended, that is to say hangs, by its links which are pivoted to points of support located above the level of the cushion plate. The nipper frame proper is marked 37, being constituted of two upright side plates or parts united by an integral bed part or cross member to the under side of which the cushion plate 5 is secured. The construction is most clearly illustrated in Figures 6, 13 and 14.

At its forward end, 38, the nipper frame is pivotally connected to the lower ends of the pair of front links 39; the pair of rear links 40 and 40′ are connected to it at points adjacent its cross member. The front links 39 are duplicates of each other, but one of

the rear links is specially formed or extended for the operation of the lap feed roll 3 as later described, for which reason it has been marked 40'. The upper ends of the front and rear links are pivoted by their upper ends to upstanding frame parts marked 41 and the links of the front pair are formed in part of threaded members so that they are adjustable as to length which enables the path of the cushion plate to be brought as close as desired to the path of the comb needles.

The operating connection of the nipper frame with the main rock shaft 14 is made by a pair of link connections 42 with the two crank arms 43 adjustably fixed on that shaft. The two links 42 are pivoted to the frame by a common pivot shaft 44 carried in lugs on the back side of the cross member of the nipper frame (see Figs. 13 and 14). The nipper-actuating crank arms 43 are adjustably secured on the rock shaft 14 by means of their split hubs. The levers 45 which carry the nipper knife 4, at their front ends, are fulcrumed on or concentric to, the pivot shaft 44 and on the inner sides of the side plates of the nipper frame.

The side plates just referred to are extended rearwardly to form the support for the top comb arms 46 which are pivoted to such extensions, so that the top comb 8, which is adjustably secured on the front ends of said arms, may be raised and lowered. The adjustment of the top comb on its arms will be seen to be the usual adjustment, enabling the inclination of the comb to be accurately set with reference to the nipper jaws. The forward ends of the top comb arms are supported by two strut links 47, one on each side of the head, which links are pivoted at their lower ends to rearwardly extending arms 48 of the front suspension links 39. These strut links are provided with slots engaged by inwardly projecting studs 49 on the top comb arms and in the normal position of the top comb these studs rest in the bottoms of the slots. When the top comb is lifted it can be held out of action by seating the studs in the notches 50 which are offset from the upper ends of the slots, as indicated in Figure 6. The studs 49 are adjustable with reference to the top comb arms which carry them. The adjustment comprises, for each arm, a plate 51 which carries the stud 49 which plate (Fig. 6) is adjustably bolted on the outer side of the arm, with the stud projecting through an arcuate slot in the latter. The object of this adjustment is to vary the depth of penetration of the top comb teeth into the tuft, and it will be apparent that the effect can be accomplished in other ways, as for instance by making the stud seat adjustable, instead of the stud. The strut links 47 are bent or staggered so that although their lower ends are pivoted to the rearwardly extending arms 48 of the front suspension links 39 which are outside of the top comb arms, their upper ends are situated on the inner sides of the top comb arms.

The link-suspension of the nipper frame, the links being of different lengths, results in a compound movement of the nipper jaws, and the tuft held by them. The jaws are in the retracted position in Figure 6. From this position, the tuft held in them follows nearly a straight line path to the detaching rolls as the nipper frame swings from the combing position to its front position indicated in Fig. 7. In the meantime, the change of the angular relation between the rearwardly extending arms 48 on the front suspension links 39 has the effect of lowering the strut links 47 and correspondingly lowering the top comb 8, the change of position being enough to bring the top comb into its operating position, while advancing with the tuft. The top comb is thus wholly carried by the nipper frame and receives its lift-and-fall from the change of angular position between the frame and the link or links which support it, and when not in use is still carried by the same members, but in an elevated position.

The operation of the nipper knife is effected coincidently with the motion of the nipper frame by means of a connection with another member of the nipper organization which changes its angular relation to the nipper frame proper as the result of the movement of the latter. In the present case the actuating crank arm 43 is the operating member. It is provided with a rearward heel 52, projecting at right angles to the length of the arm, so that it swings downwardly as the arm advances the links 42 and the nipper frame to the detaching position. This downward motion of the heel 52 is made effective on the rear ends of the nipper knife levers 45 to open the nipper jaws at the proper time, by means of the links 53, which are pivotally connected by the pivot shaft 54 to the heels 52, and by a pivot rod 55, to the forward ends of second-class levers 56 fulcrumed at 57 on the extreme rear ends of the nipper knife levers. The links 53 are formed of threaded rods for adjustment of length.

The second-class levers 56 are connected to the nipper knife levers by spring means applied so as to draw both levers together, which has the effect of closing and pressing the nipper knife against the cushion plate, this being because the front ends of levers 56 are held by the links 53. The spring means for this purpose may be variously organized and as herein shown comprises two cross-rods 58 and 59 carried respectively by the levers 56 and 45. The small rod 60 is slidingly mounted in the squared enlarge-

ments in both rods, and springs are applied to its outer ends between the enlargements and the nuts 61. The nut at each end of the rod is skirted to cover the spring and knurled on its outer side to facilitate adjustment. There are two such rods and springs, one adjacent each nipper knife lever, as shown in Fig. 2 but one in the middle would suffice. It will be seen that the spring agency for each rod is divided, part being above and part below the nipper knife levers, but obviously, and as before stated, the spring pressure can be applied in any suitable way so as to give a yielding pressure between the crank arm 43 and the nipper knife, normally closing the nipper jaws but permitting them to be opened against the tension of the spring or springs at any point in the nipper movement.

As the crank arm 43 advances the nipper frame to its detaching position it coincidently depresses the second-class levers 56 and, at a pre-determined point, the outwardly projecting lugs 62 on the latter come into engagement with the abutment screws 63 carried by the nipper knife levers and thereupon the nipper knife is positively opened, but the action is easy, because the parts are moving in substantially the same direction when the contact occurs. Obviously the adjustment of the abutment screw 63 determines the point at which opening occurs. Figure 1 shows the nipper frame retracted and the nipper opening lug 62 separated from the abutment screws, whereas Figure 7 shows the lug in engagement with and depressing the abutment screws.

Coincidently with the movement above referred to the lap feed roll 3 is rotated to advance the lap toward the nipper jaws and this rotation is accomplished by mechanism entirely carried by the nipper frame and also operated by the relative change of the angular position of one of the parts of the nipper organization. For this purpose the rear suspension link 40′, companion to link 40, is provided with a rearwardly extending arm 64 at its lower end. This arm is shown more clearly in Figures 10, 11 and 12. A plate 65 is adjustably secured to the inner face of the extension 64 as shown by Figure 11 and the forward end of this plate is connected by a link 66 to the arm of the ratchet box 67 on the end of the lap feed roll. As the nipper frame swings it will be apparent that the ratchet box will be oscillated, due to the angular movement of the arm 64, which in turn forwardly rotates the lap feed roll. The arm 64 appears in Fig. 2, but the other parts of the lap feed mechanism are omitted from this figure for the sake of clarity.

Figures 9, 10, 13 and 14 show the means whereby the lap feed roll 3 is held in position and resiliently pressed against the cushion plate. The gudgeon of the feed roll, at each end, is held in a hook bearing 68 secured on the end of a rod 69, which latter is mounted with provisions for longitudinal adjustment in a frame 70. The adjustment is secured by a set screw or bolt 71. The holder frames 70 are pivoted on the same studs, 72, by which the rear links 40 and 40′ are connected to the nipper frame, and at their rear ends are provided with springs 73, appropriately housed and adjustable. These springs are connected to finger hooks 74 which may be readily engaged or disengaged with the headed studs 75 carried by, or formed on, the ends of the top comb arm pivots. When the finger hooks 74 are thus engaged to the studs 75, the springs 73 are under tension and correspondingly press the lap feed roller against the cushion plate, but such pressure can be instantly relieved by disengaging the finger hooks from the studs 75, as will be apparent.

The nipper frame movement is imparted to the rear top detaching roll 7 to give it a movement of translation upon the rear lower detaching rolls. For this purpose blocks 76 are applied to the lower ends of the front suspension links 39 to form a pivotal connection for the connecting rods 77, and each of the latter extends forwardly, to a split sleeve 78 on a stud 79 which is pivotally carried at the upper end of a pivoted strut 80, which therefore swings with the nipper frame. The stud 79 constitutes the fulcrum of the stirrup lever 81 of the top detaching roll 7. Except at the ends of the machine, each connecting rod 77 is connected to the two adjacent suspension links 39 on opposite sides of the intermediate frame uprights so that such rods overlie the upper edges of said intermediate frame supports, between the comber heads and each pivoted strut, 80, and its stud 79, may thus constitute the support for the proximate stirrups of the top rolls 7 of adjacent comber heads, all of which rolls are thus moved in unison.

The stirrup lever 81 is weighted by means of the link 82 connecting its lower end with a weight lever 83 pivoted to the framing at 84. The weight 85, hung on this lever, presses the top detaching roller downwardly, uniformly, regardless of the position of the stirrup supporting strut 80 and while it is in motion. By lifting the lever 83 the roll pressure is relieved and if lifted far enough the stud 86 thereon will latch into a notch 87 in a latch lever and be held elevated thereby.

The latch lever notch 87 drops by gravity into its latching position. It is hung from a bracket 88 (see Fig. 7) secured to a cross bar 89ª, forming part of the comber frame.

The front detaching top roll 9 is held by a stirrup 89 at each end, pivoted at 90 to an upright pivot plate 91 which is adjust-

ably secured to a bracket 92 fixed on the frame of the machine. (See Figs. 8 and 18.) The adjustment of the pivot plate 91 on its bracket 92 is made by an arc slot and bolt and enables the top detaching roll 9 to be set forward or back on its lower roll. Pressure is applied to the stirrup lever 89 by means of the threaded link 93 connecting it with an arm 94 on a rocker member 95 which member is rotatably journalled by its trunnions 96, one of which is journalled in bracket 88 and the other in bracket 92. The arms 97 are fixed to the rocker member 95 and extend obliquely, and towards each other, beneath the sliver pan where they carry the weights 98 for the front top roll. The rocker member 95 is provided with an upstanding finger 99 by means of which it can be manually rocked on its trunnions to raise the weights, when it is desired to relieve the pressure on the front roll. A latch or hook 100, pivoted on the finger 99, is adapted to hook by gravity onto the rear edge of bracket 88 to hold the pressure relieved; the upper ends of these hooks are formed with round thumb pieces which are pressed down to unlatch them. Thus the pressure-relieving means of both front and rear detaching rolls are automatically latched and such means for the rear detaching rolls is organized so as to be unaffected by the motion imparted to those rolls and their stirrups by the nipper frame and connecting rods.

The compound movement imparted to the tuft as above pointed out, has the effect of causing it to move slightly downwards into the path of the half-lap as the nippers swing backward and so as to enter deeply into the half-lap needles (Fig. 1), while on its forward movement, it rises out of the half-lap (Fig. 7) to enter the detaching rolls. The modified crank motion imparted to the actuating rock shaft, as above described, gives a relatively fast approach of the tuft to the detaching position. This is mainly due to the fact that the point of bearing which the driving eccentric has on the rock shaft crank-arm 16^a, represented by the cross-pin 21^a, does not move past the line of centers of the shafts 14 and 34. It starts from the right-hand position shown in Fig. 15 and moves to the left, an amount equivalent to the eccentricity of 24, but does not cross the line and is at the end of its leftward travel when the tuft is closest to the detaching rolls. During its said movement the point of bearing 21 on the crank-arm 16^a is moving upwards on the latter, shortening the effective radius thereof and speeding up the motion of the nipper frame accordingly. This gives the fast approach referred to and has the advantage that the tuft is held a maximum time in the half-lap needles but yet arrives at the overlap in good season for making the best piecing with the previous tuft, while the detaching rolls are not required to begin their forward movement until the half-lap needles have passed the point where they might drag off any of the preceding tuft. This nipper motion, being independent of cams, is smooth and imparts no appreciable shock to the machine.

I claim:

1. In a cotton comber, the combination with the comb cylinder and detaching mechanism, of a nipper frame carrying the nipper knife lever and supported by front and rear links, and means independent of the links for reciprocating the frame toward and from the detaching mechanism.

2. In a comber, the combination with the comb cylinder and detaching mechanism, of a nipper frame and cushion plate supported on front and rear links one of which is pivotally connected to the machine frame above the level of the cushion plate and means independent of the links for reciprocating the frame toward and from the detaching mechanism.

3. In a comber, the combination with the comb cylinder and detaching mechanism, of a nipper frame suspended by front and rear suspension links on which it is moved toward and from the detaching mechanism.

4. In a comber, the combination with the comb cylinder and detaching mechanism, of a nipper frame suspended on front and rear suspension links of different radius lengths.

5. In a comber, the combination of the comb cylinder and detaching mechanism, of a nipper frame suspended on relatively long front suspension links and shorter rear links.

6. In a comber, the combination with the comb cylinder and a swinging nipper frame of a nipper knife, lap feed and top comb all carried by the frame, and a detaching top roll connected to and operated by the swinging movement of said frame.

7. In a comber, the combination with the comb cylinders and links supporting the nipper frame, of a detaching top roll and a connection between the supports for said roll and two of said supporting links.

8. In a comber, the combination with the comb cylinder, of a swinging nipper frame, a detaching top roll, a lever-type stirrup therefor, pressure-applying means acting on said stirrup, and means connecting the fulcrum of said stirrup with said swinging nipper frame.

9. In a comber, the combination with the comb cylinder, of a swinging nipper frame, a detaching top roll, a lever-type stirrup therefor, a fulcrum for said stirrup carried on a strut link and connected to said swinging frame, a pressure means, a pressure-relieving device for said stirrup and an automatic latch for said relieving lever.

10. In a comber, the combination with the

comb cylinder, of a link-suspended nipper frame, a detaching top roll, a lever type stirrup therefor, and a fulcrum for said stirrup carried on a strut link and connected to said frame for operation thereby.

11. In a comber, the combination with the comb cylinder, of a nipper frame, a lap feed roller carried thereon, front and rear suspension links supporting said frame and means between a said link and roller for operating said roller.

12. In a comber, link suspended, a swinging nipper structure, a lap feed roll thereon and pressure-applying means for said roll comprising a spring, one end of which is active to press said roller and the other end of which is releasably connectable to the swinging structure.

13. In a comber, a link-suspended nipper frame, a lap feed roll thereon, means whereby said roll is operated by change in angular relation of said frame and its link support and a spring to apply pressure on the roll, both ends of which are carried by and move with the parts of the nipper frame.

14. In a comber, an advancing and receding nipper frame having a nipper knife lever, and a crank arm for moving said frame having a heel part for operating said lever.

15. In a comber, an advancing and receding nipper frame carrying a nipper knife lever, an oscillating crank arm for moving the frame having a heel part for opening the lever, and means supported by the nipper frame for imparting closing pressure to the nipper knife.

16. In a comber, a link-suspended nipper frame carrying a nipper knife lever and an oscillating crank arm for swinging the frame having a part for opening the lever as the nipper frame swings forward.

17. In a comber, the combination of an advancing and receding nipper frame carrying a nipper knife lever, an oscillating crank arm moving with the frame, and means whereby the arm operates the lever, comprising spring means on said lever engaged by said crank arm.

18. In a comber, the combination of a nipper frame with nipper levers thereon, an oscillating crank arm moving with the frame, spring means connecting the nipper levers with said crank arm and tending to close the nipper levers and an abutment moving with the frame whereby said crank arm opens the nipper levers.

19. In a comber, the combination of a nipper frame, a nipper lever thereon, a lever fulcrumed on the nipper lever, and means engaged with the latter lever for operating the nipper lever.

20. In a comber, a nipper frame, a nipper lever thereon, a lever fulcrumed on the nipper lever and spring-connected thereto and means for operating the nipper lever through the other lever.

21. In a comber, a nipper frame and nipper lever, a member movably connected to said lever and carrying a part for engagement with an abutment on said lever, and nipper-operating means engaged with said member.

22. In a comber, an advancing and receding nipper frame, a top comb, and a lever member pivoted on said frame one arm of said member having a point which is fixed on the comber frame and the other arm imparting lift and fall to the top comb.

23. In a comber, a link-suspended nipper frame, one of the links having a rearwardly extended arm and a top comb carried on the frame and moved by said arm.

24. In a comber, a link-suspended nipper frame carrying a pair of top comb arms, one of the links having an arm located in a plane on the outer side of the adjacent top comb arm, a top comb support between said link arm and the inner side of said top comb arm for supporting the latter.

25. In a comber, the combination with the comb cylinder and detaching mechanism of a nipper frame supported on front and rear link members one of which is pivotally connected to the machine frame above the comb cylinder and means for reciprocating the frame toward and from the detaching mechanism, comprising a rock-shaft, an eccentric, and means for modifying the crank motion imparted by the eccentric to said rock-shaft.

26. In a comber, the combination of a nipper frame suspended by front and rear links on which it is moved toward and from the detaching mechanism, and a rock-shaft connected to said frame independently of said links for operating the same.

27. In a comber, the combination with the comb cylinder and detaching mechanism, of a nipper frame suspended on front and rear links of different radius lengths, and a rock-shaft having a crank arm connected to said frame.

28. In a comber, the combination of an advancing nipper frame, a rock-shaft carrying a driven crank arm, driving means therefor, and a shaft rotatably engaged with said crank arm and forming a motion-modulating connection between the same and said driving means.

29. In a comber, the combination of an advancing nipper frame, a rock-shaft to move the same carrying a driven crank arm, driving means therefor, and a member rotatably and slidingly engaged to said arm and forming the operating connection thereof with said driving means.

30. In a comber, the combination of a nipper frame, suspended on a long front link and a shorter rear link, a rock-shaft for actuating the nipper frame and means for

imparting a modified crank motion to said rock-shaft.

31. In a comber, a detaching top roll, a stirrup therefor mounted on a swinging fulcrum, a pressure-applying lever acting on said stirrup and an automatic gravity latch for said lever.

32. In a comber, a top roll, a sliver pan in front of it, stirrups for said roll and pressure-applying means connected to said stirrups comprising arms extending under said sliver pan.

33. In a comber, a top roll provided with stirrups, a sliver pan, and pressure means for the roll comprising rocker members connected to said stirrups and having weight-carrying arms extending inwardly and under said sliver pan.

34. In a comber, a top roll, stirrups therefor, a sliver pan and pressure-applying means for said stirrups comprising rocker members provided with weight arms extending under the pan and with a latch to hold the weight arms elevated.

35. In a comber, a top roll, a link-suspended nipper frame, the proximate links of adjacent comber heads having a common connecting rod extending forwardly in the plane of the framing between comber heads and connected with said top roll.

36. In a comber, the combination of the comb cylinder and detaching mechanism comprising top and bottom detaching rolls, of a link-suspended nipper frame and an operating connection therefrom to said top roll adapted to shift the position thereof.

37. In a comber, the combination with the comb cylinder and detaching and piecing mechanism, of a swinging nipper frame, a top comb carried thereby and a connection from the frame for operating said mechanism.

38. In a comber, the combination with the comb cylinder, of a nipper frame, a suspension link supporting the front of said frame, a swinging link supporting the rear of said frame, means for swinging the frame, a detaching bottom roll and a detaching top roll having a translation motion relative to said bottom roll.

39. In a comber, the combination with the comb cylinder, of a nipper frame, a link supporting it, and a lap feed carried by it, and means wholly carried by said frame whereby said feed is operated by change of angular relation between said frame and said supporting link.

40. In a comber, the combination with the comb cylinder, of a nipper frame, a lap feed means carried thereon, a link connecting said nipper frame to the frame of the comber and having a crank, and means between said crank and feed means for operating the latter.

41. In a comber, the combination with the comb cylinder, of a nipper frame, a lever connected to it and a lap feed carried by it and operated by an arm on said lever, and means associated with said arm for adjusting the amount of feed.

42. In a comber, a swinging nipper structure, a lap feed roll thereon and pressure-applying means for said roll comprising a spring one end of which acts on said roller and the other end of which is provided with a finger hook releasably connectible with a part of said swinging structure.

43. In a comber, an advancing and receding nipper frame, a top comb, a member carried by the frame for operating the top comb and adapted to support it when not in use.

44. In a comber, an advancing and receding nipper frame, a top comb, a supporting lever for said frame one arm of said lever carrying a strut imparting lift and fall to the top comb.

45. In a comber, a link-suspended nipper frame having a rock-shaft to actuate it located above the level of the comb cylinder, top comb arms pivoted to the rear of said frame and extending forwardly over said shaft and a top comb carried by said arms.

46. In a comber, an advancing nipper frame, a rock-shaft to actuate it located above the level of the comb cylinder, top comb arms pivotally mounted on the rear of said frame and extending forwardly over said shaft and supported at their forward ends on parts moving with said frame.

47. In a comber, a nipper frame, a rock shaft moving it toward and from the detaching rolls, a member driving said rock shaft through a crank member of changing crank radius, and means for causing said radius to diminish throughout the shaft movement in one direction and increase throughout its movement in the opposite direction.

48. In a comber, a movable nipper frame, an operating shaft therefor, a member driving said shaft through a crank member of variable crank radius, means for diminishing said radius on one direction of shaft movement and increasing it on the other and a detaching top roll movable about the axis of a detaching bottom roll arranged to coact with the nipper frame on one direction of shaft movement.

49. In a comber, a nipper frame, a shaft moving it toward and from the detaching rolls, a crank member of changing crank radius connected to said shaft, a member for driving said crank member and means for causing said radius to diminish throughout the movement of the shaft in the direction to move the nipper frame toward the detaching rolls.

50. In a comber, a nipper frame, a rock shaft extending longitudinally of the comber

for operating said nipper frame and other nipper frames, a crank member of changing crank radius carried by said rock shaft and means for causing said radius to change throughout the movement of said shaft in one direction.

51. In a comber, a nipper frame, a bodily movable top detaching roll coacting therewith, an operating rock shaft therefor, a member driving said rock shaft through a crank member of changing radius directly carried by said rock shaft and means for causing said radius to diminish as the nipper moves toward said detaching roll.

52. In a comber, a link-supported swinging nipper frame, an operating shaft to move the same toward and from the detaching rolls, a member driving said rock shaft through a crank member of changing radius, and means for causing said radius to diminish throughout the movement of the nipper frame in one direction and increase throughout its movement in the opposite direction.

53. In a comber, the combination of a detaching top roll provided with means for bodily moving it about the axis of a detaching bottom roll, a movable nipper frame coacting therewith, means for moving said frame comprising a rock shaft having a crank arm connected thereto, and a driving member for said shaft having a movable point of bearing on said crank arm.

54. In a comber, a swinging nipper frame suspended on front and rear links, a rock shaft for swinging said frame toward and from the detaching mechanism, a member driving said rock shaft through a crank member of changing crank radius and means for causing said radius to diminish throughout the movement of the nipper frame in one direction and increase throughout its movement in the opposite direction.

55. In a comber, a nipper frame, a rock shaft moving it forward and from the detaching mechanism, an eccentric driver for said rock shaft imparting motion thereto through a crank member of changing crank radius, and means for causing said radius to diminish throughout the whole of said driver's movement in one direction and increase throughout its movement in the opposite direction.

56. In a comber, a comb-cylinder shaft, a nipper frame, a rock shaft extending longitudinally of the comber for moving said nipper frame and other nipper frames toward their detaching mechanism, a crank member of changing crank radius carried by said rock shaft, an eccentric driver for said crank member mounted concentrically to and driven by said comb-cylinder shaft, and means for causing said radius to change throughout the movement of the nipper frame toward the detaching mechanism.

57. In a comber, the combination of the comb-cylinder shaft, the detaching rolls, a movable nipper frame coacting therewith, an eccentric on said shaft, a nipper-frame-operating rock shaft having a crank arm thereon and a movable bearing on said crank arm connected to said concentric and operating to change the effective radius of said arm.

58. In a comber, a nipper, a lap feed roll and pressure-applying means therefor, comprising a frame fulcrumed on the nipper, an enclosed spring bearing at one end against said frame and means for stressing said spring to press the feed roll on the lap.

59. In a comber, lap-feeding means comprising an intermittently actuated lap feed roll, a lever supporting the journals of said roll and having a spring-chamber and means for applying pressure to the roll comprising a spring normally contained in and protected by said chamber and manually disconnectible means for stressing the spring in the direction to cause it to press said roll upon the lap.

60. In a comber an advancing and receding nipper frame, a pivoted top comb having its pivotal axis fixed on said nipper frame and adapted to be swung upwards for cleaning and means moving with said frame for supporting said comb in its swung-up position.

61. In a comber, the combination of a comb cylinder, a nipper frame, a link supporting the same from a point on the machine frame above said cylinder and other means for supporting said nipper frame, a lap feed roll on said nipper frame, means wholly carried by said frame for operating said roll, a top comb on the nipper frame and means wholly carried by and moving with the nipper structure for imparting lift and fall to said top comb.

62. In a comber, the combination of a comb cylinder, a nipper frame supported on swinging links to move toward and from the detaching mechanism, a nipper knife and a closing spring therefor wholly carried by the nipper structure, a top comb on the nipper frame and means carried by the nipper structure for imparting lift and fall to said top comb.

63. In a comber, the combination with the comb cylinder, of an advancing and receding nipper frame suspended on front and rear links, a nipper knife having a closing spring wholly carried by said nipper frame, a top comb carried by said frame, means whereby said comb rises and falls as the frame swings and a lap feed roll operated by the changing angular relation between said nipper frame and one of said links.

In testimony whereof, I have signed this specification.

FRANK L. CROCKETT.