Mar. 6, 1923. 1,447,450

K. WESSEL

HEMP MACHINE

Original Filed Mar. 17, 1919 9 sheets-sheet 1

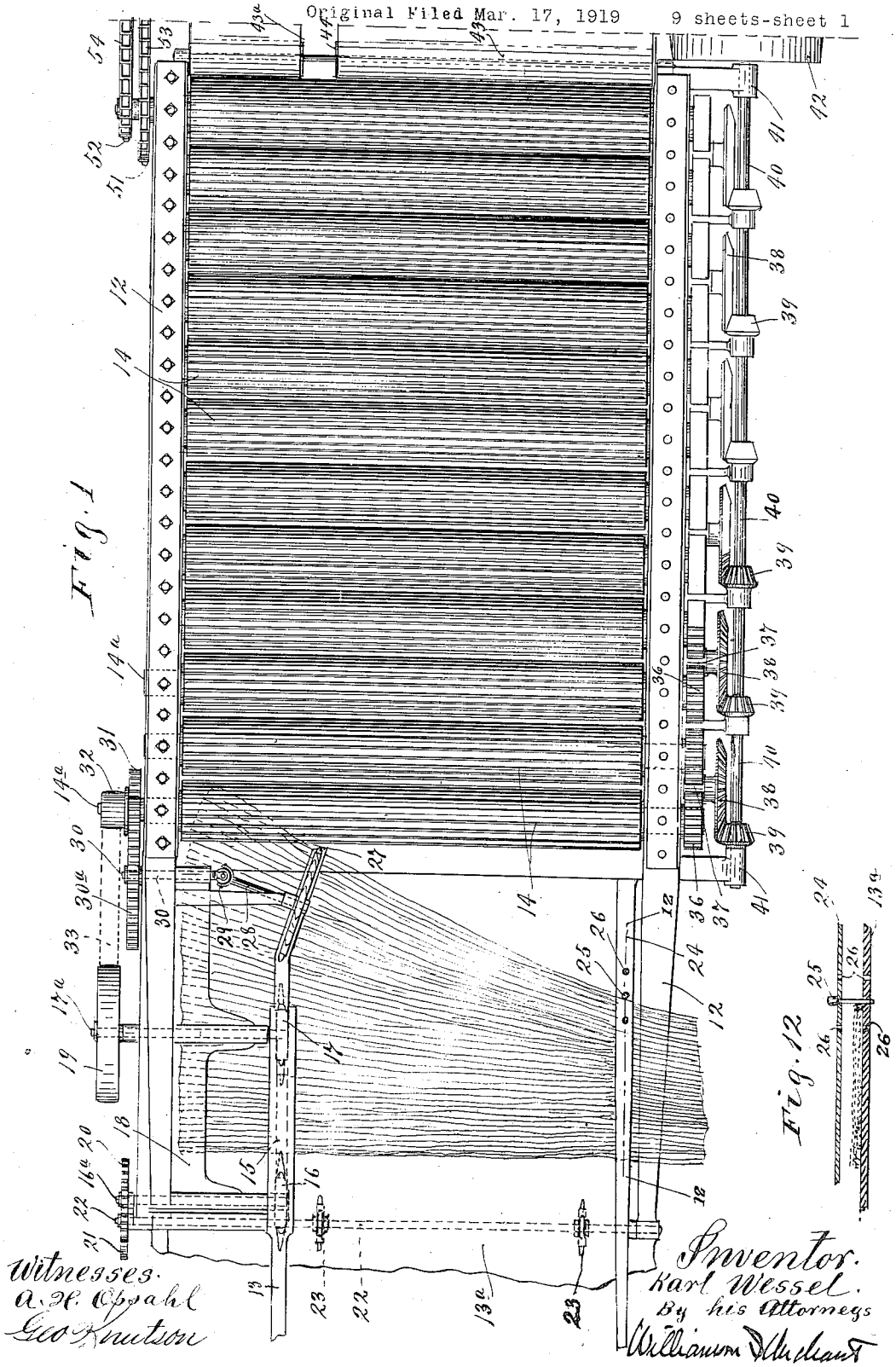


Fig. 1

Fig. 12

Witnesses.
A. H. Ogahl
Geo Knutson

Inventor.
Karl Wessel.
By his Attorneys
Williamson & Merchant

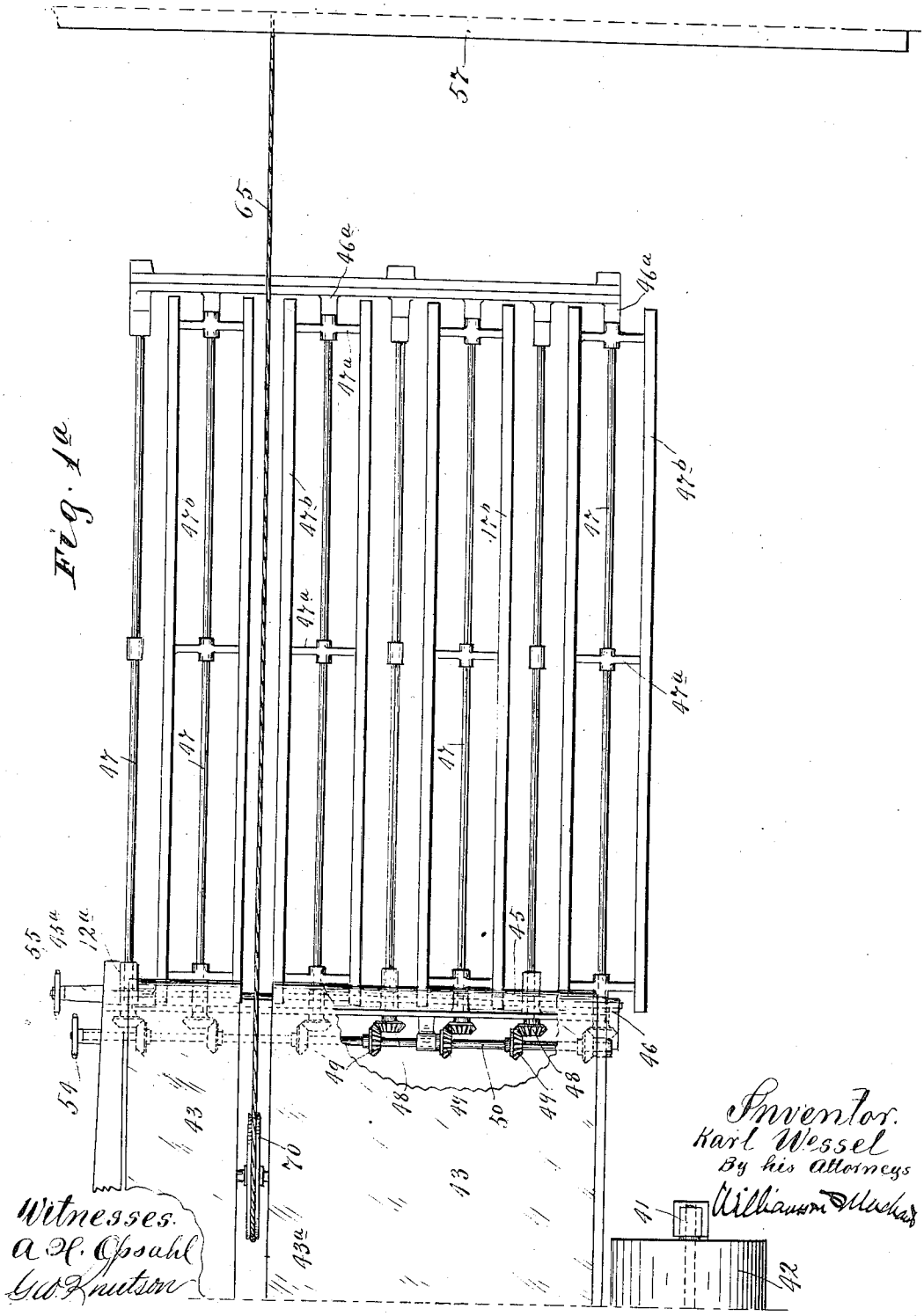
Mar. 6, 1923.

1,447,450

K. WESSEL

HEMP MACHINE

Original Filed Mar. 17, 1919 9 sheets-sheet 2



Mar. 6, 1923. 1,447,450

K. WESSEL

HEMP MACHINE

Original Filed Mar. 17, 1919 9 sheets-sheet 5

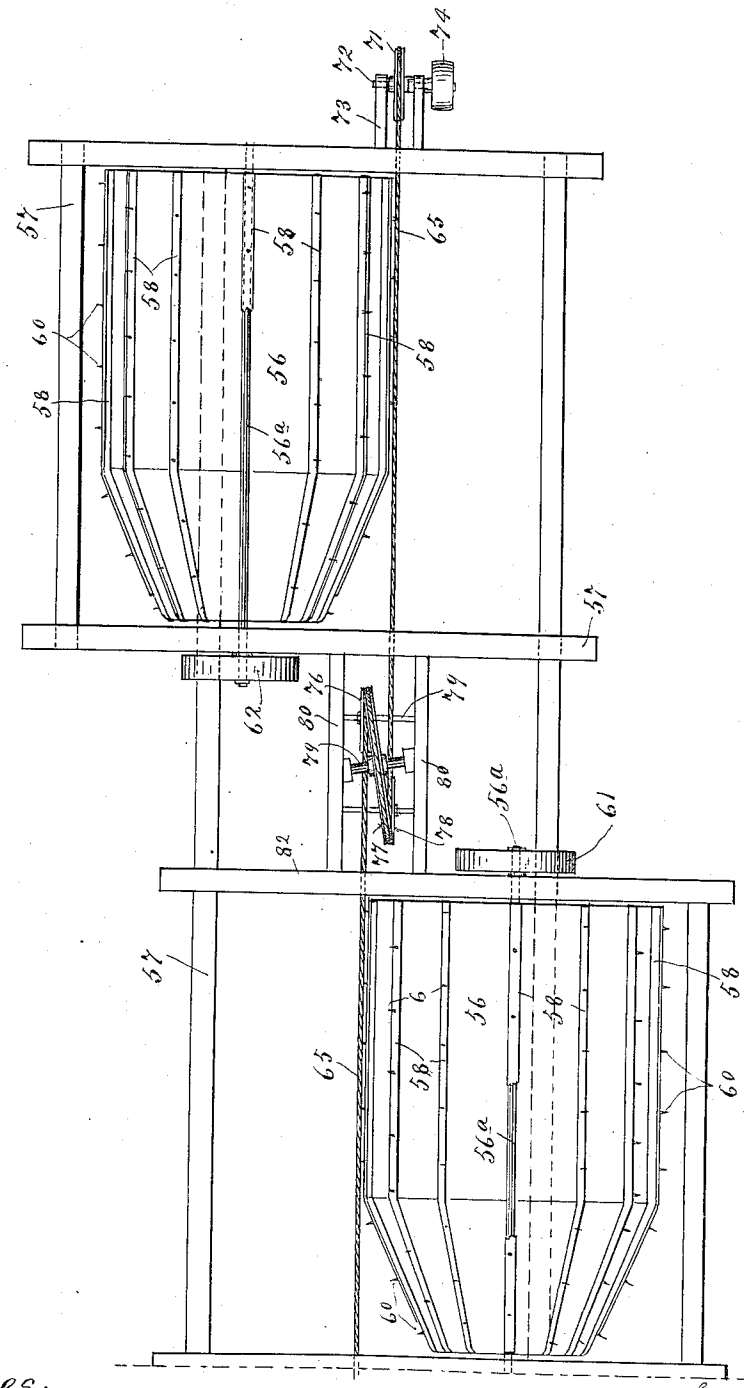


Fig. 1b

Witnesses.
A. H. Opsahl
Geo. Knutson

Inventor.
Karl Wessel
By his Attorneys
Williamson & Merchant

Mar. 6, 1923.

1,447,450

K. WESSEL

HEMP MACHINE

Original Filed Mar. 17, 1919 9 sheets-sheet 4

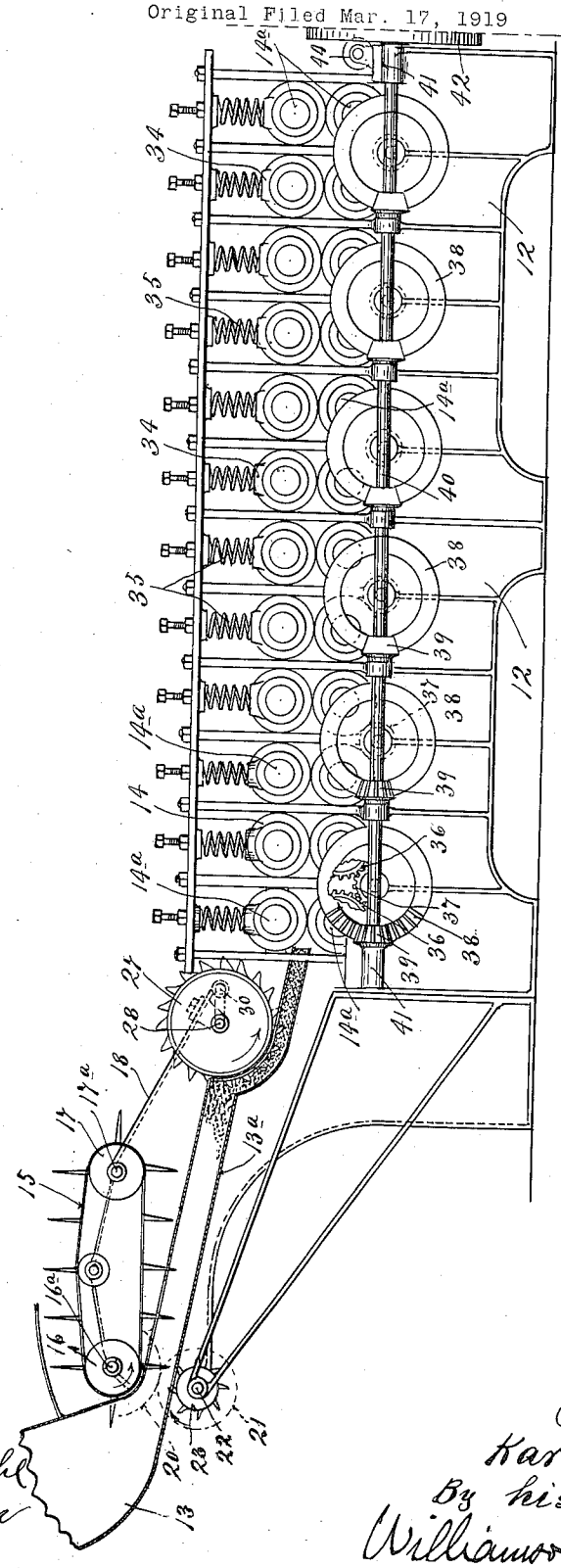


Fig. 2

Witnesses
A. H. Opsahl
Geo. Knutson

Inventor.
Karl Wessel.
By his Attorneys.
Williamson & Merchant

Mar. 6, 1923. 1,447,450

K. WESSEL

HEMP MACHINE

Original Filed Mar. 17, 1919 9 sheets-sheet 5

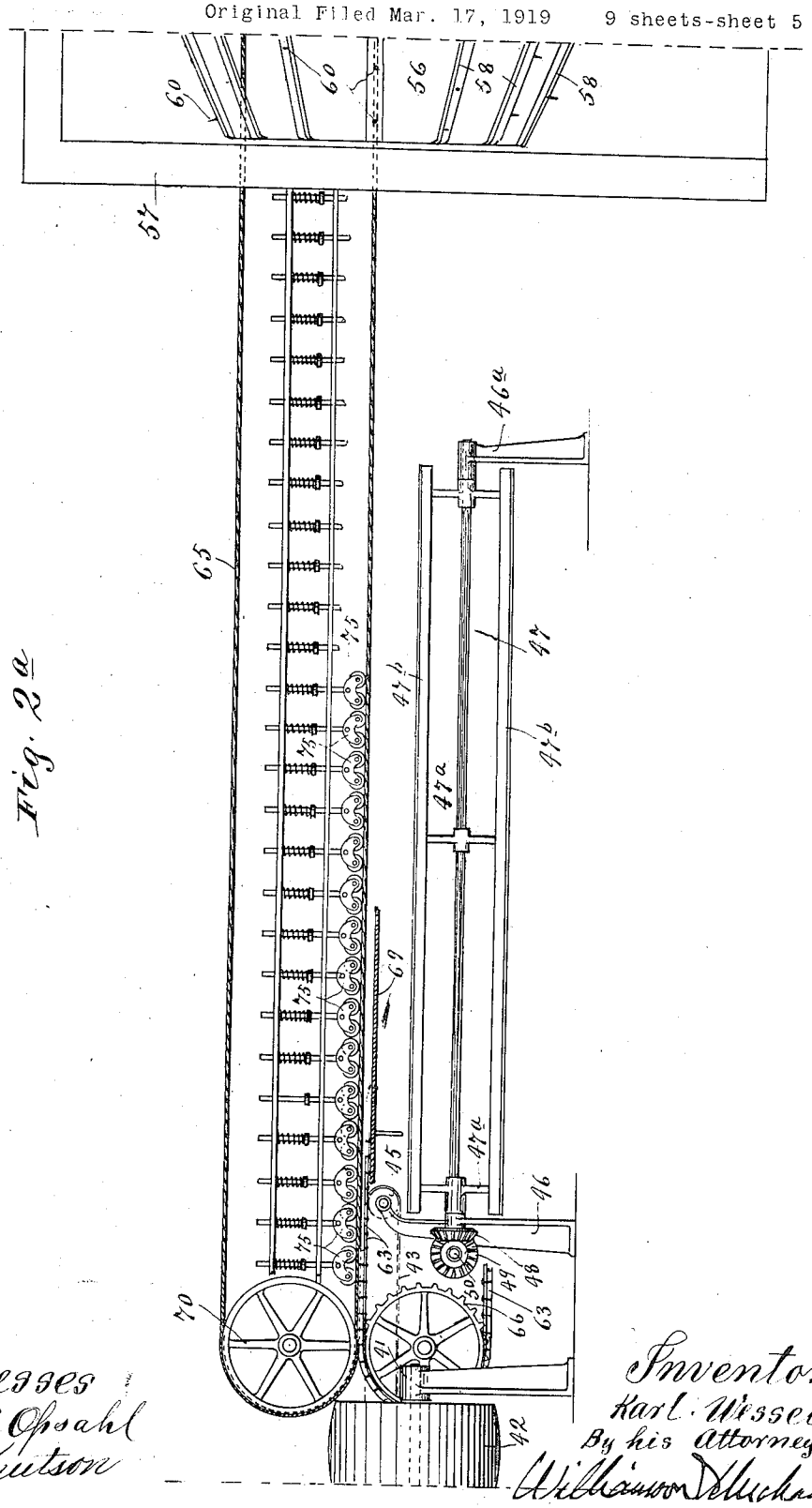


Fig. 2a

Witnesses:
A. H. Opsahl
Geo. Knutson

Inventor:
Karl Wessel.
By his Attorney.
Williamson & Merchant

Mar. 6, 1923. 1,447,450

K. WESSEL

HEMP MACHINE

Original Filed Mar. 17, 1919 9 sheets-sheet 6

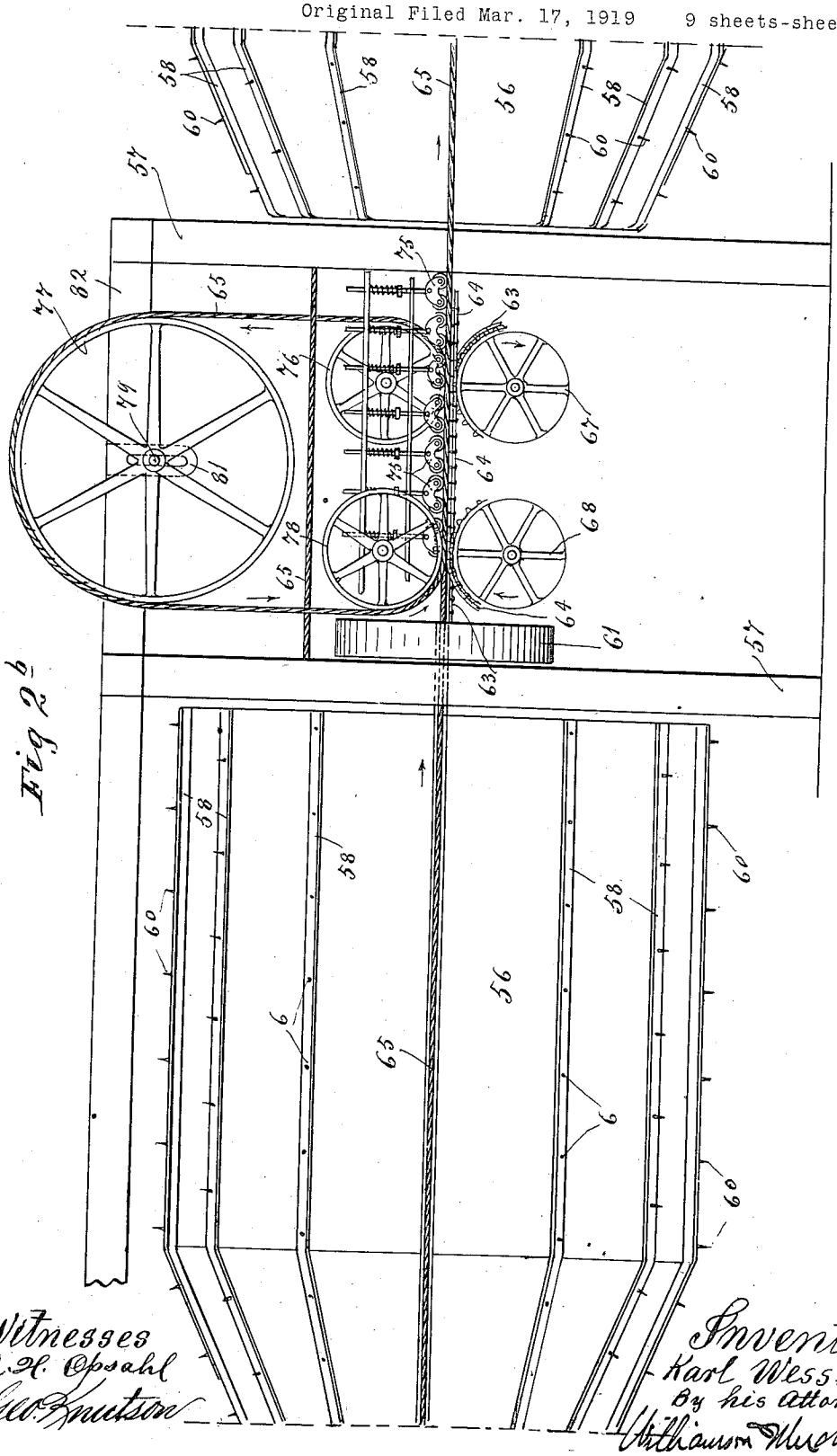


Fig 2b

Witnesses
A. H. Opsahl
Geo. Knutson

Inventor
Karl Wessel
By his attorneys
Williamson & Merchant

Mar. 6, 1923.

1,447,450

K. WESSEL

HEMP MACHINE

Original Filed Mar. 17, 1919 9 sheets-sheet 7

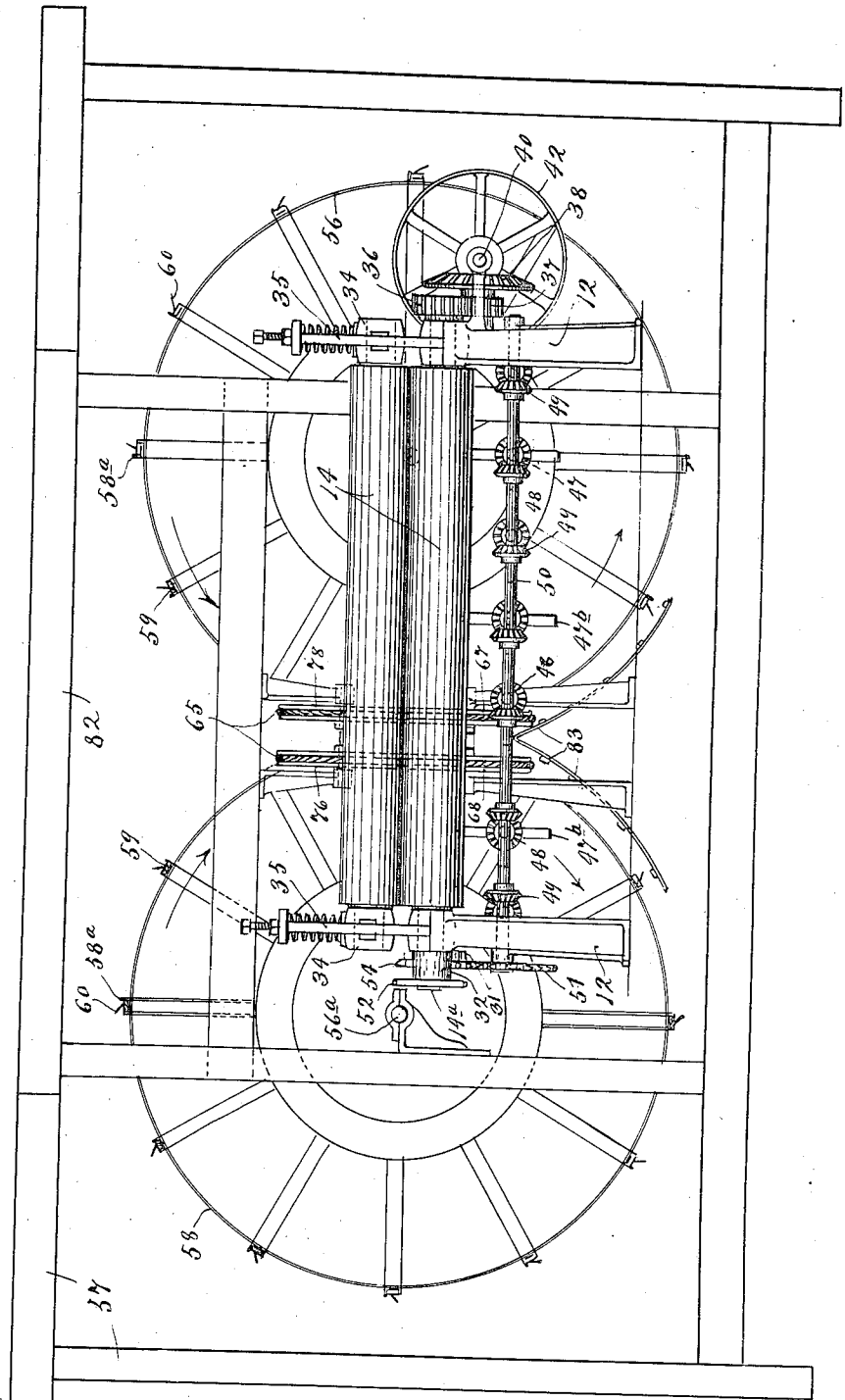


Fig. 3

Witnesses
A. H. Opsahl
Geo. Knutson

Inventor
Karl Wessel
By his attorneys
Williamson & Merchant

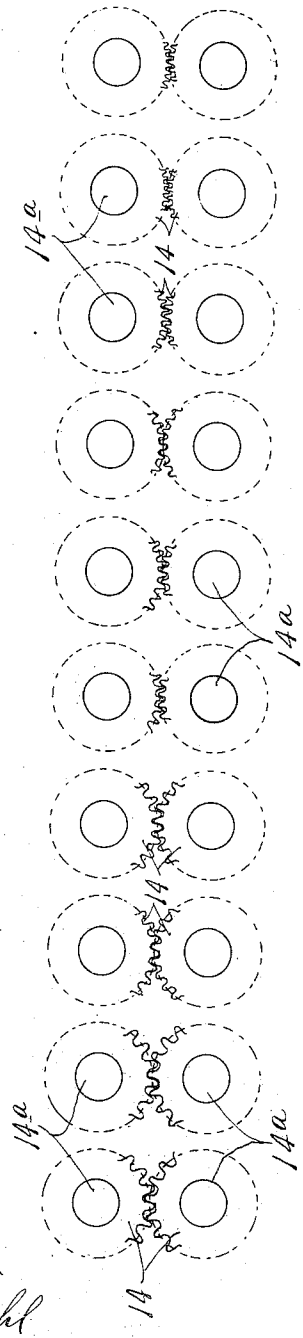
Mar. 6, 1923. 1,447,450

K. WESSEL

HEMP MACHINE

Original Filed Mar. 17, 1919 9 sheets-sheet 8

Fig. 4.



Witnesses
A. H. Osahl
Geo Knutson

Inventor.
Karl Wessel
By his Attorneys
Williamson & Merchant

Mar. 6, 1923. 1,447,450

K. WESSEL

HEMP MACHINE

Original Filed Mar. 17, 1919 9 sheets-sheet 9

Fig. 7

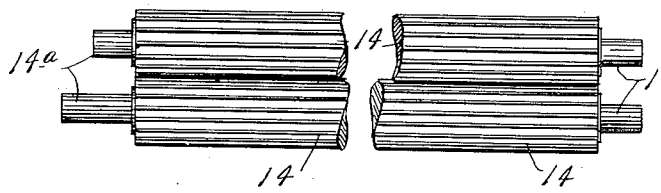


Fig 8

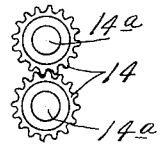


Fig. 9

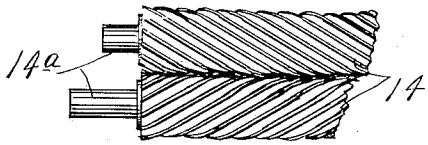


Fig. 10

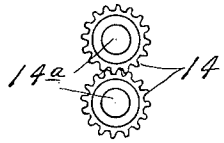


Fig. 6

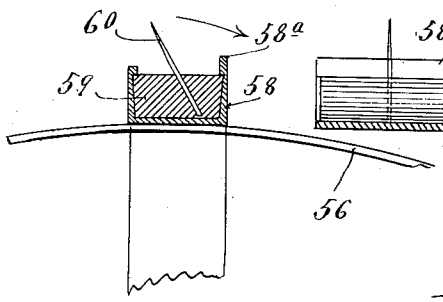


Fig. 5

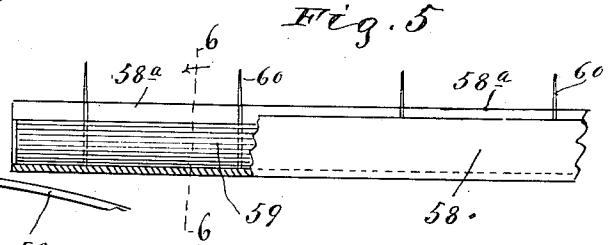
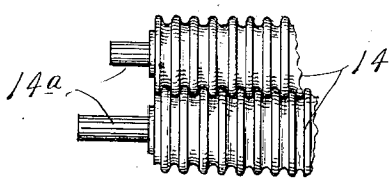


Fig. 11



Witnesses
A. L. Opsahl
Geo. Knutson

Inventor.
Karl. Wessel
By his Attorneys
Williamson & Merchant

Patented Mar. 6, 1923. 1,447,450

UNITED STATES PATENT OFFICE.

KARL WESSEL, OF ST. PAUL, MINNESOTA.

HEMP MACHINE.

Application filed March 17, 1919, Serial No. 283,074. Renewed August 10, 1922. Serial No. 581,014.

To all whom it may concern:

Be it known that I, KARL WESSEL, a citizen of the United States, residing at St. Paul, in the county of Ramsey and State of Minnesota, have invented certain new and useful Improvements in Hemp Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My present invention has for its object to provide an improved and highly efficient machine for obtaining fiber, particularly, from hemp, but also from various other fiber producing stocks.

Generally stated, the invention consists of the novel devices and combinations of devices hereinafter described and defined in the claims.

This machine acts upon the hemp as it comes from the field, except that for most purposes, it is preferable that the hemp be first retted and then dried. The main product of the machine is a combed hemp fiber suitable for making rope, aeroplane canvas, and various other things. As a byproduct, I obtain combings or short fibers suitable for making linen rugs, oakum, and from the waste shives and fine particles, I obtain what has usually been treated as a waste product, but which is suitable in packing and for making insulating material.

The fiber is placed in a suitable hopper, and by a novel feeding device, is fed obliquely to a series of breaking rollers which break up the shives and woody portions of the hemp. From the breaking rollers, the fiber is carried to so-called beaters which further loosen the shives and shake and beat the same from the fiber. From the beaters, the fiber is carried to hackle drums or reels by which the fiber is straightened out and combed. For carrying the fiber past the beaters and the hackle drums, I provide cooperating endless gripper belts which are of a novel construction and operate in a novel and highly important manner, hereinafter described.

In the accompanying drawings which illustrate the invention, like characters indicate like parts throughout the several views.

Referring to the drawings:—

Figs. 1, 1^a, and 1^b are supplemental plan views with some parts broken away, showing each a section or portion of the machine, and collectively, showing the complete machine;

Figs. 2, 2^a and 2^b are views in side elevation with some portions broken away and some parts sectioned showing each a section or part of the machine, and, collectively, showing the complete machine;

Fig. 3 is an elevation looking rearward at the front end of the machine with the hopper and certain other parts removed;

Fig. 4 is a diagrammatic view of the hackle rollers;

Fig. 5 is a detail in elevation showing one of the bars of one of the carding drums or reels;

Fig. 6 is a section on the line 6—6 of Fig. 5, some parts being broken away;

Fig. 7 is a plan view showing a pair of hackle rollers illustrated in the main views, some parts being broken away;

Fig. 8 is an elevation of the driving rollers shown in Fig. 7;

Fig. 9 is a fragmentary view in plan illustrating a modified form of the hackle rollers;

Fig. 10 is an elevation of the driving rollers shown in Fig. 9; and

Fig. 11 is a fragmentary view in plan illustrating still further modified form of the hackle rollers, and Fig. 12 is a fragmentary vertical section taken on the line 12—12 of Fig. 1.

Attention is first directed to Figs. 1 and 2, wherein the framework of the machine is indicated by the numeral 12 and is composed of heavy side plates and suitable cross connections. The front or receiving end of the frame work 12 supports a suitable feed hopper 13 which, in its bottom, has a downwardly inclined delivery deck 13^a that delivers to a series of corrugated breaking rollers 14, the nature of which latter will presently be described.

The hemp stocks or straws are placed in the hopper in parallel arrangement extending transversely of the machine, but by a novel means, and as an important feature of the invention, they are delivered obliquely to the breaking rollers. This may be accom-

plished by various different devices, but preferably is accomplished by the means illustrated in the drawings, which means comprises an endless toothed belt 15, preferably in the form of a sprocket chain arranged to run over sprockets 16 and 17 secured, respectively, to shafts 16^a and 17^a mounted in long bearings of a plate-like support 18 rigidly secured to the main frame and supported above the deck 13^a. The outer end of shaft 17^a is provided with a pulley 19 and the outer end of shaft 16^a is provided with a gear 20 that meshes with a similar gear 21 on one end of a transverse shaft 22. Shaft 22 is located just below the deck 13^a and is provided with laterally spaced toothed feed wheels 23 that work through slots in the deck. At the opposite side of the machine, there is a retaining bar 24 that extends from the top plate of the hopper 13, is properly spaced above the deck 13^a and at its extended end, is suitably secured at a fixed part of the main frame 12. A stop bearing 25 is adapted to be inserted through one of a series of holes 26 in the bar 24 and deck 13^a. The tooth-equipped belt 13 acts as a sort of a rake and catches the end portions of the straws as they come from the hopper and accelerates their feed movement toward the breaking rollers so that they are immediately thrown to oblique positions in respect to the rollers. This angular movement is further insured by a supplemental toothed feed wheel 27 secured to one end of a short shaft 28 journaled in a projecting arm of bearing plate 18. Shaft 28 is oblique in respect to the axes of the rollers 14 and it is connected by a knuckle joint 29 to a shaft 30 journaled in the bearing plate 18 and provided at its outer end with a spur gear 30^a that meshes with a spur gear 31 on the shaft 14^a of the first lower roller 14, and this shaft 14^a is also provided with a pulley 32 over which and the pulley 19, an ordinary belt 33, indicated by dotted lines in Fig. 1, is arranged to run. It will now be seen that toothed feed wheel 27, toothed belt 15 and the wheel-equipped shaft 22 are all driven from the first lower roller 14.

In the construction illustrated in Figs. 1 to 7, inclusive, the breaking rollers 14 are provided with longitudinal tooth-like corrugations. The corrugations of the upper and lower rollers run together very much like gears and they are, in the direction of the travel of the straw therethrough, made progressively finer and finer, as diagrammatically illustrated in Fig. 4. The progression need not be an even progression, nor need it increase, as between an adjacent pair of rollers, but may be by pairs or sets; but the teeth should be made increasingly finer and greater in number on each roller in the general direction indicated, so that the shives will be reduced progressively and broken up finer and finer as the straw is worked between the several sets of breaking rollers. The lower breaking rollers are journaled in fixed bearings on the framework 12, whereas the upper rollers are journaled in bearings 34 mounted for vertical movements in the framework 12 and yieldingly pressed downward by springs 35.

The shafts 14^a of the lower rollers, at one end, are provided with spur gears 36 that mesh with intermediate spur pinions 37 formed on the hubs of the beveled gears 38 suitably journaled to the adjacent side of the frame 12. Beveled gears 38 mesh with beveled pinions 39 on a common shaft 40, but is journaled in suitable bearings 41 secured on the adjacent side of the frame 12, this construction being best illustrated in Figs. 1 and 2. At its rear end, shaft 41 is shown as provided with a pulley 42 over which a power-driven belt, not shown, will run to impart motion to the running parts of the machine thus far noted and to certain other parts presently to be described.

From the breaking rollers, the hemp straw is carried rearward to the beaters by a pair of endless feed belts or aprons 43 that run over front and rear rollers 44 and 45. The shaft of idle roller 44 is journaled in suitable bearings on the framework 12, while the shaft of roller 45 is journaled in a bearing bracket 46 and in an extension 12^a of the main frame 12. For an important purpose presently to be noted, the two belts 43 are spaced to leave a clearance gap at 43^a. There are a plurality of brackets 46 and these are spaced transversely of the machine and are longitudinally aligned with similar bearing brackets 46^a that are located further rearward.

Working below the plane of the feed belts 43 at the rear thereof and extended forwardly and rearwardly of the machine, is a plurality of laterally spaced shafts 47 journaled in the brackets 46 and 46^a and provided at their front ends with beveled gears 48 that mesh with beveled gears 49 on a transverse counter shaft 50, which shaft is journaled in projections of the brackets 46. The shaft 14^a of the rearmost lower roller 14, at one end, is provided with two sprockets 51 and 52. A sprocket chain 53 runs over the sprocket 51 and over a sprocket 54 (see Figs. 1 and 1^a) on the projecting end of the transverse shaft 50. A sprocket chain 54 runs over the sprocket 52 and over a sprocket 55 on the projecting end of the shaft 45^a of the roller 45.

The longitudinally laterally spaced shafts 47 have rearwardly projecting arms 47^a, to the ends of which, beater bars 47^b are secured. The said elements 47, 47^a and 47^b constitute beater reels for action on the straw and broken shives in a manner hereinafter more fully described. Here, how-

ever, it should be noted that the beater reels, in a direction transversely of the machine, are set so that adjacent reels will always be in planes at ninety degrees to each other, that is, if one of the intermediate reels is in a horizontal position, the two adjacent reels will be in a vertical position, as clearly shown in Fig. 1[a].

From the beating reels, the hemp is carried rearward, first past one and then past another of a plurality of hackle drums or cylinders 56 (see particularly Figs. 1[b] and 2[b]). The shafts 56[a] of these hackle drums are offset transversely of the machine but extend horizontally and longitudinally of the machine and are journaled in suitable frames 57. The front ends of the said drums are in the form of truncated cones and the said drums are provided on their external surfaces with so-called cone bars 58 (see particularly Figs. 1[b], 2[b], 5 and 6). These cone bars 58 are preferably of channel irons, and as a highly important feature, they are provided at their front edges, in respect to the direction of rotation with a projecting scraper blade 58[a]. The channels 58 securely hold inserted wooden strips 59 that are provided with hackle pins or teeth 60 that are turned backward in respect to the direction of rotation (see Figs. 5 and 6). The importance of this above relative arrangement of scraper blade 58[a] and back turned hackle pins 60 will be more fully given in the description of the operation.

The above noted two hackle drums are offset so that their inner portions are slightly on opposite sides of a longitudinal plane projected centrally rearward from the gap 43[a] between the feed belts 43. At its rear end, the shaft 56[a] of the forward drum 56 is provided with a pulley 61, and at its front end, the shaft 56[a] of the rear drum 56 is provided with a similar pulley 62. The said drums may be driven at the proper speed, preferably from eighty to one hundred revolutions per minute by power driven belts, not shown, but which run over the pulleys 61 and 62.

The so-called gripper belts are three in number, to wit, two endless lower belts 63 and 64 and an upper belt 65. The lower belts 63 and 64 are preferably block faced link belts, while the upper belt 65 is an endless rope belt. The lower belt 63 runs over a front sprocket 66 and over a rear sprocket 67, while the belt 64 runs over a front sprocket 68, over a similar rear sprocket not shown. Sprocket 66 is located in the space 43[a] between the belts 43. The above noted sprockets 66, 67 and 68 are journaled in suitable bearings, not shown, but well understood with those familiar with this type of machines. The upper run of the lower belts 63 and 64, as is usual. will run over suitably supported rails 69.

The rear portion of the upper gripper belt 65 is in a vertical plane immediately above the front lower belt 63, while the rear portion thereof is in a vertical plane immediately above the rear lower belt 64. At its forward portion, said belt 65 runs over a guide sheave 70 journaled in the usual way, to a suitable support, not shown. This pulley 70 is immediately above sprocket 66. At its rear portion, belt 65 runs over a driving sheave 71 on a short shaft 72 that is journaled in a suitable bearing 73 and provided with a pulley 74 over which a belt, not shown will run to impart motion to the said upper belt 65.

The two belts 63 and 64 may be driven in the usual or any suitable way, but in a direction to cause sprockets 67 and 68 to rotate, as indicated by arrows marked on Fig. 2[b]. The two belts 63 and 64 are laterally offset, and it will be noted that the sprocket 68 for the front portion of rear belt 64 is located ahead of the sprocket 67 for the rear portion of belt 63, so that there is an overlapping of the said two belts. The lower portion of upper belt 65 runs in close engagement with the upper portions of both of the lower belts 63 and 64 and is maintained in such close contact by spring-pressed lower equipped heads 75, which pressure devices may be and preferably are of the well known construction, and hence, not necessarily described in detail.

As a feature of this invention, the upper belt 65 is run over both of the offset lower belts 63 and 64 and the lower portion of this upper belt, by a novel arrangement of guide wheels, is given a lateral offset in a manner which will now be noted in detail.

The forwardly moving lower run of said belt 65 passes forward to and then under and upward from a guide sheave 76 then upward over, thence upward and backward over the large guide sheave 77, and thence downward and again forward under a guide sheave 78. The guide sheaves 76 and 78 are laterally offset, the sheave 76 being located directly over sprockets 67 while sheave 78 is located directly over sprockets 68. Sheaves 76 and 78 are shown as journaled on spindles 79 (see Figs. 1[b] and 2[b]) secured in a framework 80. By the above arrangement, the single upper belt 65 is made to cooperate with both of the offset lower feed belts and maintains pressure on the straw throughout the entire feeding action. The guide sheave 77 is mounted for vertical adjustments on a slotted bracket 81 secured to a beam 82 that connects the upper portions of the frames 57.

In Fig. 9, the breaking rollers are shown as provided with spiral corrugations, while in Fig. 11, they are shown as provided with circumferential corrugations.

The usual concaves 83, made up of spaced

slats, will be arranged in co-operation with the lower inner side portions of the two hackle drums 56.

Operation.

The operation of the machine described is as follows:

The hemp or straw is fed from the bottom of the hopper by the rake acting endless toothed feed belt 15, and this belt, acting chiefly on the butt ends of the straw, delivers the straw from the hopper by an action that turns the straw obliquely in respect to the breaking rollers to which it is delivered. The toothed wheel 27, as stated, increases its turning action and insures the delivery of the butt ends of the straws between the first pair of breaking rollers. This feeding action, of course, is continuous and uniform. The angle at which the straw will be delivered to the rollers, may be varied by different adjustments of the stop pin 26, it being, of course, evident that the further the stop pin is away from the rollers, the greater will be the angle at which the straw will be delivered to the rollers. The straw, when fed between the rollers, will maintain an oblique position, in respect to the rollers. This is important, not only because it makes it possible to maintain a uniform constant feed to the rollers, but because the straw, after it has passed from between the lowest pair of rollers, will line in an oblique position, in respect to the direction of travel, so that it may be automatically delivered to and automatically picked up by the gripping cables.

Hitherto it has been customary to feed the straw endwise at approximately right angles to the rollers and the straw delivered from the rollers has necessarily been picked up by hand and manually delivered to the hackle drum or combing devices.

In passing between the several pairs of breaking rollers, the shived or woody portions of the straw will be broken up progressively into finer and finer particles, and separated or loosened from the fiber, but the fiber, itself, will not be broken. There is also less liability to break the fiber in feeding the straw obliquely between the rollers than when it is fed at right angles to the rollers.

A great deal of the shive will fall between the rollers, and hence, be separated from the fiber before the fiber leaves the rollers, but a considerable of the shives will adhere to the fiber in broken and partly loosened condition.

The fiber from the rollers will pass obliquely onto the feed belts 43, and by the said belts, will be delivered between the receiving portions of the gripper belts 63 and 65. These belts will grip the fiber of the straws at their intermediate portions, but at one side of their longitudinal centers, and will carry the straw, with its fibrous portions hanging down, so that it is carried over the beating reels 47—47[b]. The fiber will be struck, beaten and stirred up so as to loosen the adhering shives and separate the same from the fiber.

From the beating reels, the fiber, nearly, but not always quite relieved from the shives, will pass to the first hackle drum, and those ends of the fibers or straws that hang in that side that is toward the first hackle drum will be subjected to the first or most forward hackle drum. The ends subjected to the first hackle drum are the head ends and comprise considerably more than half the lengths of the straws. These portions will pass onto the open concave, that co-operates with the first or foremost hackle drum.

After passing rearward of the first hackle drum, the fibers will pass under the looped intermediate portion of the upper belt 65, and in thus passing the gripper belts, will shift their point of engagement with the fibers in a direction from the butt ends towards the head ends thereof, so that the fiber will then have longer down-hanging butt ends than when they passed by the first hackle drum. Otherwise stated, the fiber will then be held between the lower portion of the upper belt 65, and as the fiber passes the second or rearmost hackle drum, it will be acted upon by the latter. This much for the general statement of the way or general manner, in which the two hackle drums operate on the fiber, but there are important actions which must be considered in detail.

The inner sides of both hackle drums, of course, move downward under rotation of the drums. The scraper blades 58[a] and hackle pins 60 on the tapered front end portions of the drums, act first on the lower portions and then gradually farther and farther upward on the fiber, and, of course, comb out the fiber and relieve the same from adhering shives. In this combing action, the scraper blades 58[a] perform an important function. In the first place, they operate frictionally to scrape loose the shives and to spread out the fiber evenly so that the hackle pins will come into action properly and evenly on the fiber; and in the second place, to prevent the fiber from catching at the base of the hackle pins. The hackle pins, therefore, act on the fiber while it is being frictionally held a short distance from the pins by the so-called scraper blades. Thus the tendency to break the fiber is greatly reduced, and a much better combing action results. By repeated experiments, I have found that very greatly improved results can be obtained by combining the so-called scraper blades with the hackle pins, and with the said scraper blades located up a short distance ahead of the hackle pins, in a direction of the rotation of the drum, with their edges projecting radially outward of the

bases of the exposed portions of the hackle drums.

The well combed and cleaned fiber which passes beyond the last hackle drum, will by the so-called gripper belts, be delivered to any suitable receptacle or receiving device, which, however, forms no part of the present invention.

What I claim is:—

1. In a machine of the kind described, the combination with breaking-rollers and a hopper for containing the fibrous straw, of a feed device for delivering the straws from the hoppers to said breaking-rollers, operative on the straws near one end thereof, and a retarding device operative on the straws near the other end thereof, whereby the straws will be delivered obliquely to said rollers.

2. In a machine of the kind described, the combination with breaking-rollers and a feed hopper, the latter being arranged to hold the fibrous straws primarily in positions approximately parallel to said rollers, an endless tooth feed-belt for delivering the fibrous straws from said hopper to said rollers, operative on the straws near one end thereof, and a retarding device operative on the straws near the other end thereof, whereby the straws will be delivered obliquely to said rollers.

3. In a machine of the kind described, the combination with breaking-rollers and a hopper for containing the fibrous straw, of a feed device for delivering the straws from the hoppers to said breaking-rollers, operative on the straws near one end thereof, and a retarding device operative on the straws near the other end thereof, whereby the straws will be delivered obliquely to said rollers, the said retarding device being adjustable toward and from said rollers to vary the angle of delivery of the straws to the rollers.

4. In a machine of the kind described, the combination with breaking-rollers and a hopper for containing the fibrous straw, of a feed device for delivering the straws from the hoppers to said breaking-rollers, operative on the straws near one end thereof, and a retarding device operative on the straws near the other end thereof, whereby the straws will be delivered obliquely to said rollers, the said feed device comprising an endless tooth feed-belt and a tooth feed-wheel.

In testimony whereof I affix my signature in presence of two witnesses.

KARL WESSEL.

Witnesses:

CLARA DEMAREST,

BERNICE G. BAUMANN.