Sept. 13, 1932. W. HOLDSWORTH 1,876,936

GILL DRAWING FRAME

Filed May 29, 1930 4 Sheets-Sheet 1

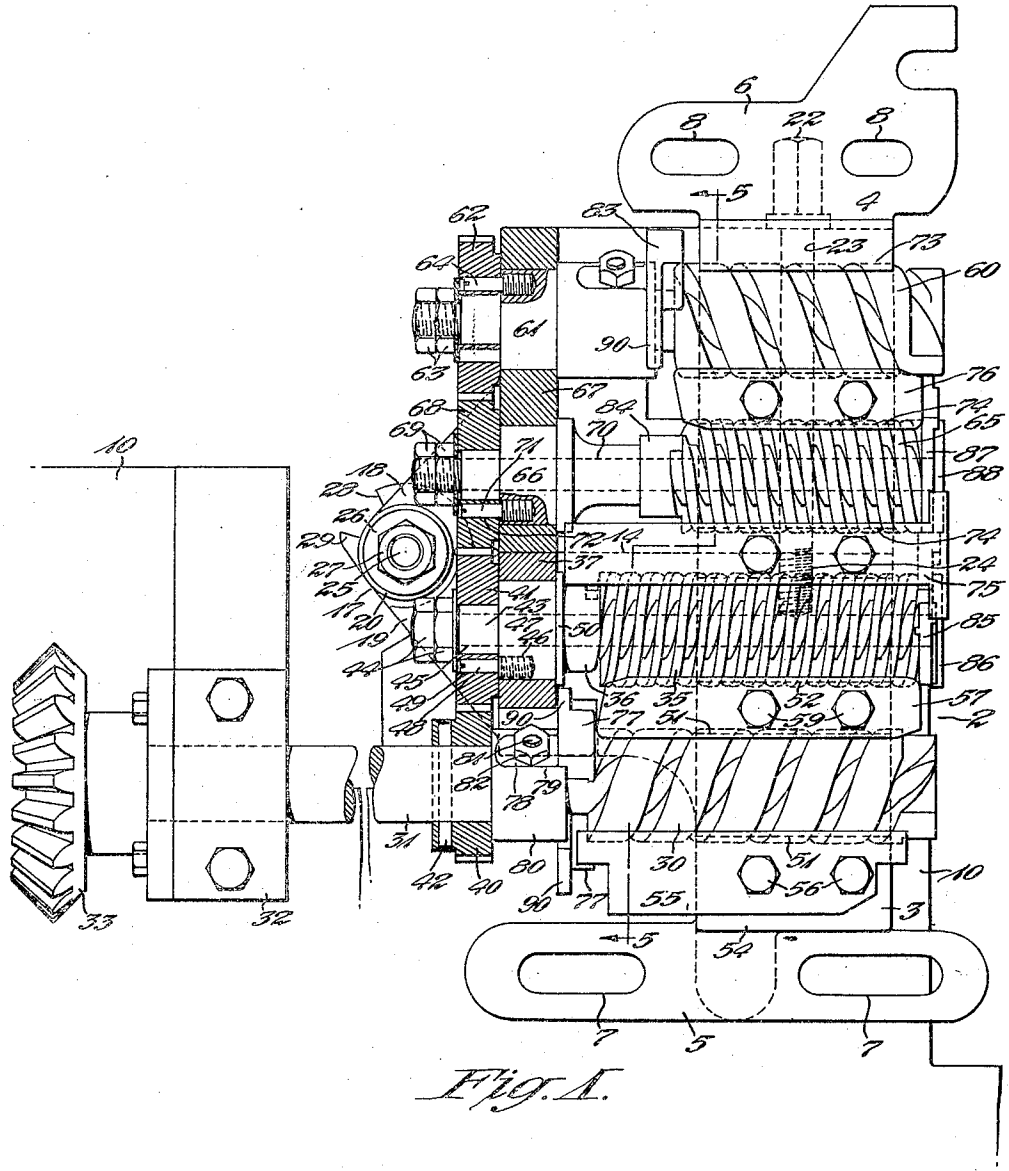


Fig. 1.

Inventor:
Willie Holdsworth
By
Attorneys.

Sept. 13, 1932. W. HOLDSWORTH 1,876,936

GILL DRAWING FRAME

Filed May 29, 1930 4 Sheets-Sheet 2

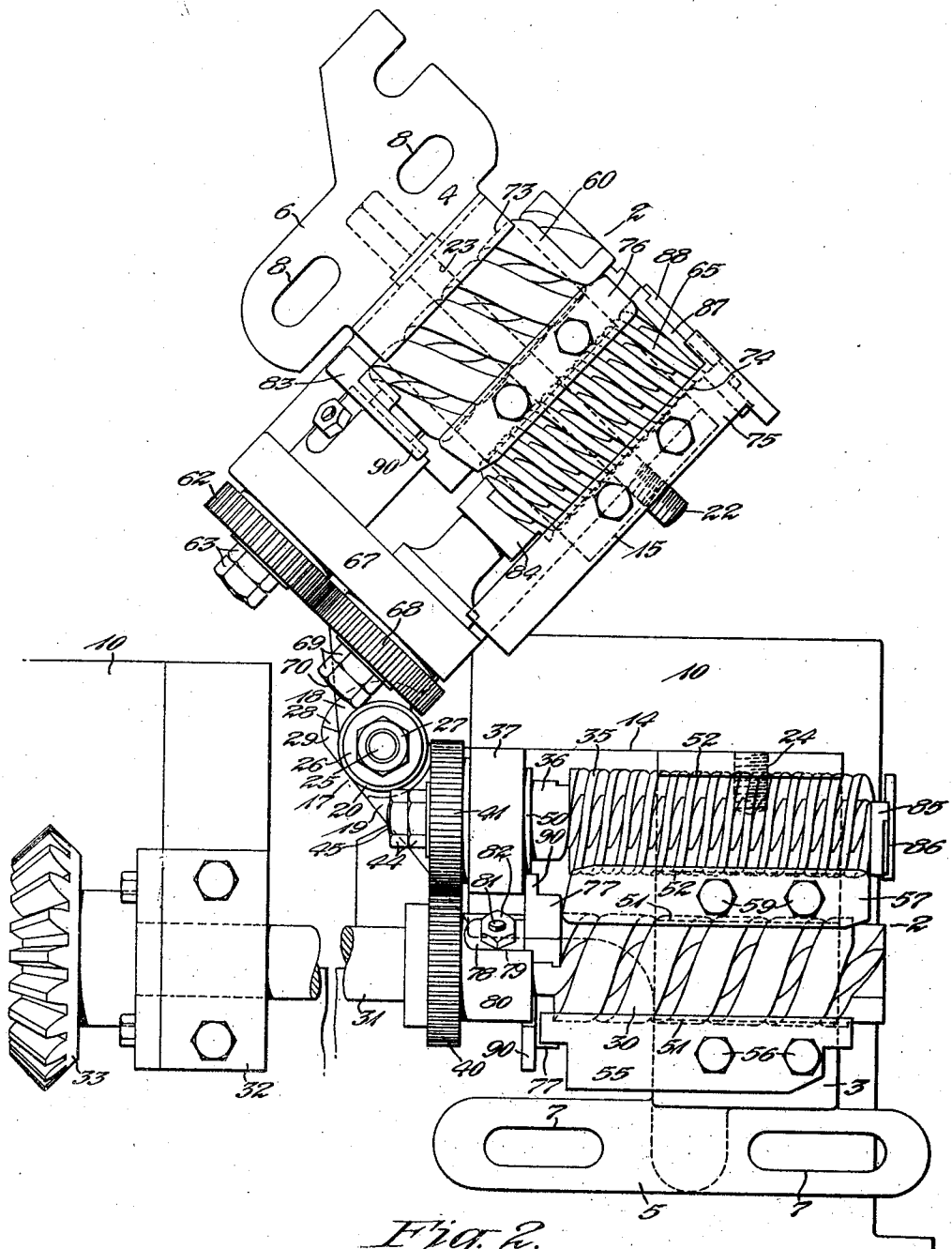


Fig. 2.

Inventor:
Willis Holdsworth
By
Attorneys.

Sept. 13, 1932. W. HOLDSWORTH 1,876,936

GILL DRAWING FRAME

Filed May 29, 1930 4 Sheets-Sheet 3

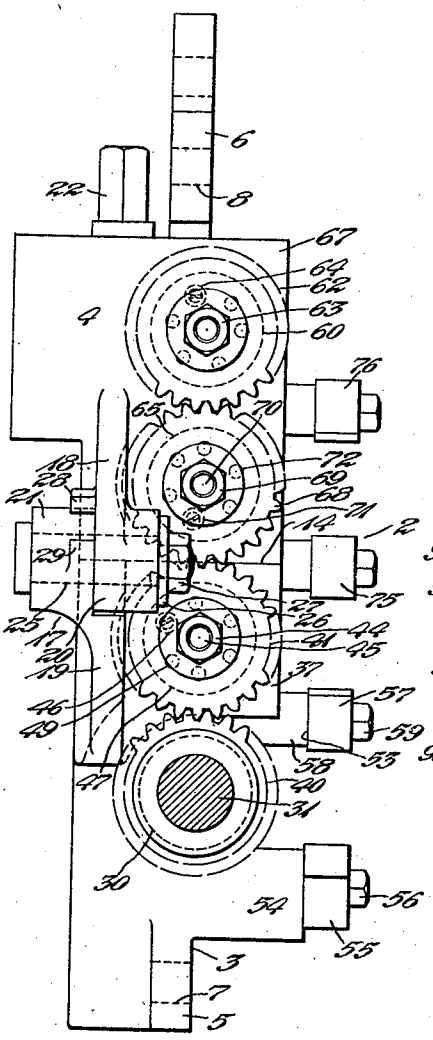


Fig. 5.

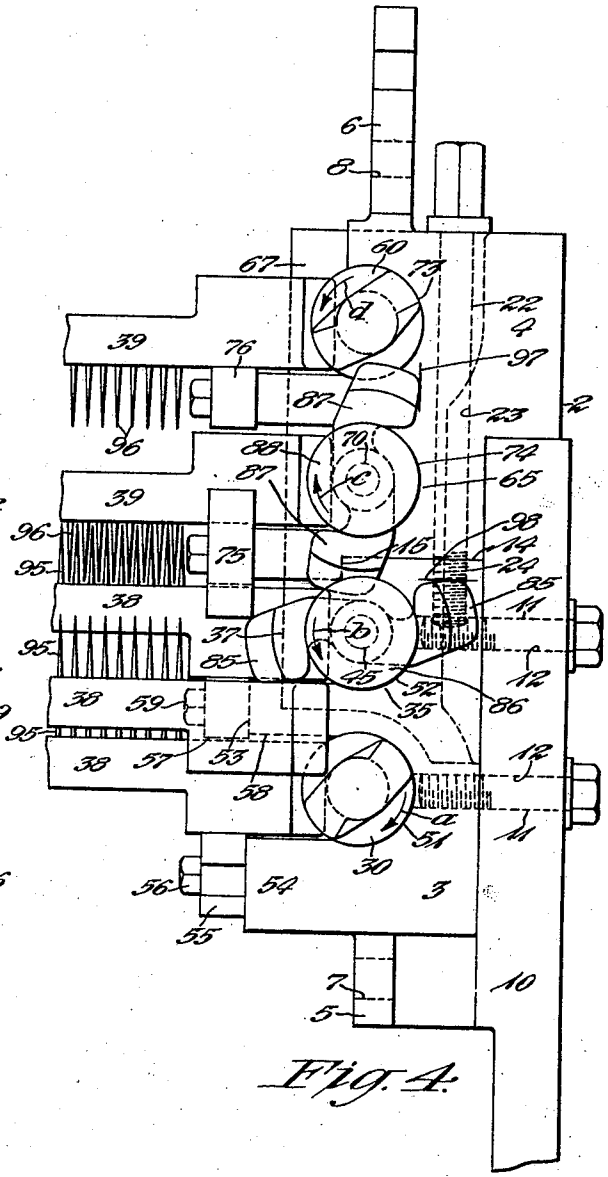


Fig. 4.

Inventor:
Willis Holdsworth
By
Remington & White
Attorneys.

Sept. 13, 1932. W. HOLDSWORTH 1,876,936

GILL DRAWING FRAME

Filed May 29, 1930 4 Sheets-Sheet 4

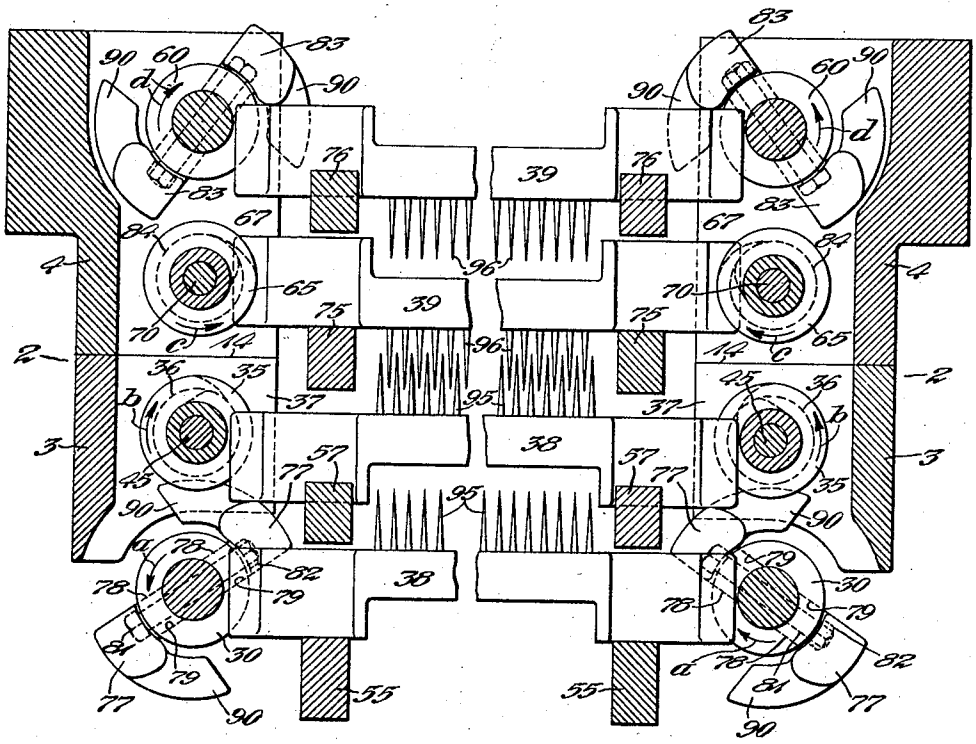


Fig. 5.

Inventor:
Willie Holdsworth
By Cummings and White
Attorneys.

Patented Sept. 13, 1932 1,876,936

UNITED STATES PATENT OFFICE

WILLIE HOLDSWORTH, OF PROVIDENCE, RHODE ISLAND

GILL-DRAWING FRAME

Application filed May 29, 1930. Serial No. 457,062.

This invention relates to gill-drawing frames or like machines and consists in improvements in the construction and arrangement of the gill-screws for traversing the toothed faller-bars which act on the material as it is drawn through the frame.

The invention relates particularly to gill-drawing frames or gill-boxes of the so-called French type in which two opposite sets of faller-bars are arranged with their teeth or pins intersecting and adapted to be traversed through the fibers in one direction and then returned at the end of their stroke to repeat the traverse to provide for the continuous operation of the teeth on the material.

One object of the invention is to provide in a gill-drawing frame an arrangement of the traverse screws which permits a quicker and more convenient removal and replacement of the faller-bars when it is required to change the same for any purpose.

Another object of the invention is to provide in a gill-drawing frame means for moving one set of screws away from the other set whereby the faller-bars may be lifted out without requiring the screws to be turned to release the bars individually.

Another object of the invention is to provide in a gill-drawing frame an improved journal mounting for the gill-screws whereby to more rigidly hold the several screws in alinement and prevent excessive wear on the bearings.

Another object of the invention is to provide in a gill-drawing frame an improved construction of the gill-screws and their co-operating cams which permits the faller-bars to enter the threads of the screws in line with the axes thereof to travel a straight course throughout the whole length of the screws to effect a maximum length of operative stroke with the pins or teeth in full engagement with the material.

Another object of the invention is to provide in a gill-drawing frame means whereby when the opposite faller-bars enter the threads of their respective screws they are prevented from canting or rocking so that their teeth will not strike and be bent or broken.

Another object of the invention is to provide in a gill-drawing frame means whereby after the faller-bars have been placed in the screws the driving gears therefor may be returned into intermeshing relationship and properly indexed to secure the correct timing of the screws and their cams.

Another object of the invention is to provide a device of the type specified which may be constructed in the form of an attachment or fitment adapted to be applied to gill-drawing frames of usual design and construction without material alteration therein or reconstruction thereof.

Further objects of the invention are set forth in the following specification which describes a preferred form of construction of the device, by way of example, as illustrated by the accompanying drawings. In the drawings:

Fig. 1 is a longitudinal elevation of the two pairs of gill-screws at one side of the machine, showing the arrangement of their journals and the gears which connect them to be driven in unison from the shaft or spindle of the bottom screw;

Fig. 2 is a similar view illustrating the hinged connection between the bearings for the upper and lower pairs of screws and showing the upper set of screws swung open with respect to the lower set to provide for the removal and replacement of the faller-bars in the threads of the screws;

Fig. 3 is an end view in elevation of the journal boxes or bearings for the several screws showing the same in operative relationship with their driving gears in mesh;

Fig. 4 is an end elevation of the same viewed in the opposite direction and showing the normal position of the faller-bars with respect to the screws; and

Fig. 5 is a sectional elevation taken on line 5—5 of Fig. 1 and illustrating the two sets of screws at each side of the machine with the faller-bars extending therebetween, certain of the bars being shown in transfer from the return screws to the opposite screws.

In certain types of gill-drawing frames, particularly in the French or Swiss type, two pairs of gill-screws are employed at either

side of the machine with a series of opposite fallers having intersecting teeth or pins arranged to be traversed thereby in one direction during the working stroke and transferred to the return screws to be carried back in the opposite direction and again shifted to the first-mentioned screws to provide for a continuous traversing movement thereof. With the usual construction of this type of machine where the faller-bars are arranged in opposite relationship during their working stroke with their pins intersecting it is a laborious and time-consuming operation to remove the bars from the machine. That is to say, the screws must be slowly rotated by hand to transfer the bars to the return screws, from which they are removed one at a time. As an improvement over this arrangement the present invention contemplates the provision of means whereby the two pairs of screws at either side of the machine may be swung open or moved apart to allow the bars to be lifted out of the screws in groups rather than removed individually.

As a further feature of the present invention the form and construction of the screws provide that when the bars are transferred into the screws which traverse them during the working stroke they are immediately centered with the axes of the screws so as to be traversed in a straight line with a maximum engagement of their intersecting teeth with the fibers throughout the full extent of operative stroke equal to the length of the threaded portion of the screws. This arrangement is of very considerable advantage because in gill-drawing frames of the present type the screws are relatively short and to attain maximum efficiency the faller-teeth must be engaged with the fibers to the fullest possible extent during their working stroke.

As still another important feature of improvement the present invention provides means for preventing the bars from canting or rocking as they are transferred into the threads of the opposite screws so that the points of their teeth will not strike and become bent or broken.

Referring to the drawings, 2 designates the hinged journal block or bearing-member for the two pairs of gill-screws at one side of the frame, the two sections 3 and 4 thereof being provided with suitable lugs or ears 5 and 6 having slots 7, 8, for receiving the bolts which attach the faller-guides, not herein illustrated, in proper relation to the screws. It will be understood that there is a journal block 2 at each side of the machine frame as represented in Fig. 5 of the drawings, but as both members are of the same construction and arrangement only one will be described in detail. The bottom section 3 of the journal block 2 is rigidly attached to the side frame 10 of the machine by any suitable means, Fig. 4 showing bolts 11 passing through holes 12 in the frame and screwed into the side of the block.

The upper section 4 of the journal block normally rests against the flat top face 14 of the lower section 3, the joint being broken with a vertical shoulder at 15 to form a ledge or offset portion which holds the two sections in alinement when they are closed together. The upper section 4 may be arranged to move away from the lower section in any suitable manner and, preferably, a hinged joint 17 is provided with its axis substantially coincident with the parting line between the two members 3 and 4. The hinge between the two sections 3 and 4 may be constituted by ears 18 and 19 projecting from the rearward side of each section and formed with hubs 20 and 21, respectively, through which extends a pivot pin or stud 25 held in place by a washer 26 and nut 27, see Fig. 3. The upper ear 18 has a laterally projecting flange or lip 28 disposed with its end in position to strike against the end of a lip 29 on the lower ear 19, see Fig. 1, whereby to form a stop for limiting the movement of the upper section 4 when it is swung open as illustrated in Fig. 2 of the drawings.

A square-headed bolt 22 passes down through a hole 23 in the upper section 4 of the journal block with its threaded end screwed into a tapped hole 24 in the lower section 3, see Fig. 4, to hold the two parts of the bearing member in connected relationship.

The lowermost screw 30 of the set of four at each side of the machine, which is the return screw for the bottom pair, is constituted as the drive-shaft for the other screws in the series. For this purpose it is constructed with a reduced spindle 31 extending axially from its end and journaled in a capped bearing 32 which may form a part of or be suitably attached to the side frame 10 of the machine. At the end of the spindle 31 is a bevel gear 33 keyed or otherwise suitably secured thereto. The bevel gear 33 meshes with a similar gear on a horizontal driving shaft, not herein illustrated, which extends across the machine to connect the screws on the opposite sides thereof to be driven from a suitable source of power in accordance with the usual arrangement in machines of the present type.

Arranged above and in parallel relationship with the bottom screw 30 is a so-called top-screw 35 having threads of relatively fine pitch adapted to traverse the faller-bars 38, see Fig. 4, during their operative stroke, the bottom screw 30 being of coarser pitch as clearly shown in the drawings to effect a more rapid return of the bars during their inoperative stroke; the construction and arrangement of each pair of screws being in accordance with the usual custom as is well known to those versed in the art. The screw

35 has a reduced shank 36 with a larger bearing-boss 47 journaled in a bearing 37 formed integral with and projecting from the side of the section 3 of the journal block or member 2.

The bottom-screw 30 is provided with a spur gear 40 having its teeth meshing with those of a similar gear 41 fast on the shank end of the top-screw 35. The gear 40 is keyed to the spindle 31 of the bottom-screw 30 by means of a pin 42 driven through its hub, while the gear 41 is secured fast on the reduced end 43 of the top-screw 35 by means of nuts 44 set up against a washer. The nuts 44 engage the threads on the end of a bolt 45 extending through an axial bore in the screw 35, the bolt serving as a means for fastening the faller-cam to the opposite end of the screw in the manner as later explained. The gear 41 is held rotatively on the end of the screw 35 by means of a stud 46 screwed into the end of the bearing-boss 47 and having a reduced portion 48 engaging one of a number of holes 49 in the gear. As illustrated in Fig. 3 of the drawings, the gear 41 is provided with a series of holes 49 arranged circumferentially of its axis and spaced at unequal distances apart to provide for adjusting the gear to index its teeth in proper relationship with the threads on the screw 35.

A flange 50 on the shank of the screw 35 abuts one side of the bearing 37 and the hub of the gear 41 abuts its opposite side to take the axial thrust of the screw. To provide for the lateral thrust on the screws 30 and 35 at their outer ends their peripheries are pocketed in circular recesses or bores on the lower section 3 of the journal block, see Fig. 4, the screw 30 turning in a socketed bearing 51 and the screw 35 in a similar socket 52. It will be noted that the socket 51 for the bottom-screw 30 is open on the front and is extended forwardly to the vertical face 58, thus forming a shelf or ledge at the top of the screw; while the upper socket 52 terminates at the parting line 15 of the joint between the sections 3 and 4 so as not to interfere with the engagement of the ends of the faller-bar with the threads of the screws. Below the bottom-screw 30 the bearing member is extended in a shelf or ledge 54 forming a mounting for the bottom saddle 55 which is bolted thereto at 56 and serves as the support or track on which the faller-bars 38 slide. The saddle 57 for supporting the fallers 38 as they travel in the top-screw 35 is secured to the shelf or ledge 58, previously described, by means of bolts 59. The two screws 60 and 65 also have saddles 75 and 76 bolted to ledges on the upper block section 4.

The upper pair of gill-screws 60 and 65, which traverse another set of bars 39, see Fig. 4, are journaled in the hinged section 4 of the bearing block 2 in substantially the same manner as the screw 35. Referring to Fig. 1, the screw 65 is of less length than the top-screw 35 but its threads are of the same pitch to adapt it to traverse the fallers 39 during their working stroke in cooperative relationship with the fallers 38 traversed by the screw 35, that is with their teeth in intersecting relationship as illustrated in Fig. 4 of the drawings. The screw 60 traverses the fallers 39 in the opposite direction to return them into position to be transferred back to the screw 65 after they have completed one working stroke and its arrangement is substantially the same as the bottom-screw 30 first described. The screw 65 has a boss 66, similar to the boss 47 on the screw 35, which is journaled in a bearing formed by a projecting portion 67 of the section 4 of the block. The end of the screw 65 is reduced in diameter to receive a gear 68 secured fast thereon by nuts 69 screwed onto the end of a bolt 70 extending axially through the screw. A stud 71 has its reduced end projecting through one of a series of holes 72 in the gear 68 in the manner and for the purpose as described in connection with the gear 41.

The screw 60 has a reduced portion 61 journaled in the bearing projection 67, and a gear 62 is secured to the further reduced extension thereof by means of nuts 63 screwed onto its end. A stud 64 keys the gear 62 rotatively with the screw 60 through its engagement with one of a series of holes therein arranged in the manner as above described. The overhanging portion of the screws 60 and 65 are supported in bearing sockets 73 and 74, shown in Fig. 4 as being of substantially the same construction as the sockets 51 and 52 in which the screws 30 and 35 turn.

As is well known to those versed in the art the gill-bars or fallers are transferred from one screw to the other at the ends thereof by means of faller-cams rotating with the screws. The inner end of the screw 30 is provided with two opposite cams 77 which are constructed in the form of radial arms having feet 78 inserted in slots 79 in the shank 80 of the screw 30, being secured in place by a bolt 81 with a nut 82 at one end thereof, see Figs. 1 and 5. Similar cams 83 are secured in slots in the cylindrical end of the uppermost screw 60, the construction and method of fastening the cams in place being substantially the same as described in my United States Letters Patent No. 1,510,550, dated October 7, 1924. It is to be particularly noted that that portion of the top-screw 35 which is located opposite the cams 77 is reduced in diameter, forming the shank 36, previously referred to. This shank portion 36 of the screw 35 is of greater diameter than its root portion at the bottom of the threads on the screw, but of less dameter than the outer periphery of the threads so that the cams may pass through the opening thereby provided, see Fig. 5, to lift the fallers 38 into central-

ized position with respect to the axis of the top-screw 35. Through this provision, which constitutes an important improvement in the art, the faller-bars 38 are carried upwardly to a sufficient distance to cause them to be centered axially with the top-screws at either side of the machine as they enter the threads thereof. By this improved arrangement the fallers 38 are lifted into position for their teeth to fully engage the fibers at the beginning of their working stroke so that they will have the maximum efficiency throughout the whole length of their traverse in the screws 35 as will later be more fully explained.

The cams 83 on the return screw 60 of the upper pair are likewise arranged to carry the faller-bars downward to the full extent to engage them with the threads of the screws 65 in working position at the beginning of their operative stroke, the screw 65 having a neck or shank 84 less than the full diameter of its threads but greater than the root portion of the screw.

The cams at the outer ends of the screws 35 and 65 have radial arms similar to the cams at the inner ends of the screws 30 and 60 but are held in place in a different manner. As shown most clearly in Figs. 1 and 4, the two opposite arms of the cams 85 are made integral with a central hub which is secured to the end of the screw 35 by means of the cylindrical head 86 of the bolt 45, previously described, which extends through the axial bore of the screw. This construction is shown more in detail in my United States Letters Patent No. 1,635,181, dated July 12, 1927, it being noted that the cam-arms have suitable keys engaging slots in the ends of the screws to hold them rotatively therewith. The cams 87 for the screw 65 are of the same construction as the cams 85, being secured in place by the head 88 of the bolt 70 previously mentioned.

During the operation of the machine the gill-screws act to traverse the faller-bars to comb the fibers in the manner as next explained. With the screws in operative relationship as illustrated in Figs. 1 and 4, one set of fallers 38 are arranged in close association with their ends resting on the saddles 57 at either side of the machine. The terminal portions of the faller-bars are chamfered off at an angle, as illustrated in Fig. 4, to incline them in accordance with the inclination of the helical threads of the screws 35 at the opposite sides of the machine. The other set of fallers 39 is arranged in the same manner extending horizontally across the machine with their ends resting on the saddles 75 and their chamfered terminal portions engaging in the threads of the screws 65. It has been explained that the screws 65 are of somewhat less length than the screws 35, and therefore a less number of fallers are employed to be traversed from these latter screws as is the usual practice in machines of the present type.

Referring to Fig. 4, it will be noted that the teeth 95 on the fallers 38 project vertically upward from the top thereof, while the teeth 96 on the opposite fallers 39 project downwardly from the bottom of these bars, the opposite teeth being staggered so that they alternate along the length of the bars. During the operative stroke of the bars 38 and 39 the latter are not directly in alinement, the teeth on one bar being slightly in advance of those on the adjacent opposite bar. In this way the teeth on the opposite fallers 38 and 39 are arranged in staggered relationship projecting entirely through the fibers which are drawn through the machine in a path equidistant between the opposite edges of the bars. With the machine operating under power the two opposite shafts or spindles 31 are turned in the direction indicated by the arrow *a* in Figs. 4 and 5, as driven from the bevel gears 33 which mesh with similar bevel gears on the cross-shaft, not shown. The spindles 31 turn the screws 30 in the direction as above noted and through the gears 40 and 41 drive the screws 35 at either side of the machine in the opposite direction as indicated by the arrow *b* in Figs. 4 and 5. The gears 41 on the screws 35 mesh with the gears 68 on the screws 65 to drive the latter in the direction indicated by the arrow *c* in Figs. 4 and 5, and these gears in turn drive through the gears 62 to rotate the screws 60 in the direction indicated by the arrow *d*. As before indicated, the screws 35 and 65 constitute the traversing-means for the faller-bars 38 and 39, respectively, during their working stroke as the bars slide on the saddles 57 and 75.

As screws 35 and 65 turn in opposite directions their threads are of opposite inclination so that both sets of bars 38 and 39 will have the same direction of movement to maintain their teeth 95 and 96 in intersecting relationship as they pass longitudinally through the fibers. As each bar 38 reaches the end of the threads in the screws 35 on the opposite sides of the machine it is engaged by the cams 85 on the outer ends of these screws to carry it down across the ends of the saddles 57 and into the leading end of the threads on the bottom screws 30. Fig. 4 illustrates one of the bars 38 as being transferred downwardly from the screw 35 into the threads of the screw 30 at one side of the machine, the bar being guided in its transfer by spring-pressed conductors or faller-guides of usual construction acting against its sides, these latter elements being common to machines of the present type and not herein illustrated to avoid obscuring the other parts of the mechanism. As each faller 38 is transferred into the threads of the bottom-screws 30 its end come to rest on the lower

saddles 55 and the turning of the screws will feed the bar in the reverse direction from its working stroke to return it into position to be transferred back into the top-screws 35.

As the bars 38 complete their traverse in the return screws 30 the cams 77 at the rearward end of these screws come into action against the bottom of the bars to lift them upwardly in the manner as illustrated in Fig. 5; it being understood that both the bottom-screws 30 and the top screws 35 have double threads so that two cams are required on each screw to act on the bars as they emerge from the ends of the threads on opposite sides of the screws. As the bar 38 in transfer is lifted upwardly to engage its ends with the threads of the screws 35 the end of the cams 77 in engagement with the underside of this bar pass under the reduced neck or shank portion 36 of the screws 35 to provide for lifting each bar into central position, as regards the axis of the two opposite screws, at the instant that it engages in the threads thereof.

It will be noted by reference to Figs. 1 and 2 of the drawings that the left-hand end of the saddles 57 is beveled off on its upper edge to a very slight extent to provide a clearance for the bars 38 to ride onto the top of the saddles as they start their feed or traverse in the threads of the screws 35. In machines of the present type it has previously been found necessary to cut away or bevel off the ends of the saddles to a very considerable extent so that the faller-bars are not immediately brought into centralized position with respect to the axes of the screws as they start their traverse in the threads thereof. That is to say, it has been the usual practice to lift the bars under the action of the cams only to a sufficient extent to partly engage them with the threads in the top-screws, and thereafter the bars slide upwardly along the inclined upper edges of the saddles to finally center them with respect to the screws. This previous form of construction is deficient in that the bars start their operative or working stroke before their teeth are entered through or completely engaged with the fibers under treatment and, consequently, the efficiency of their working stroke is reduced or curtained. Stated briefly, the bars are not immediately brought into position to fully engage their teeth with the fibers so that they make a portion of their stroke without combing the fibers.

Referring to Fig. 1, it will be noted that the rounded nose ends of the cams 77 are relatively broad so that they form an adequate support for the fallers 38 as the latter are raised thereon. Furthermore, the fallers are guided by the lateral fins or flanges 90 at the ends of the cams which lie alongside the bars as they are being lifted, whereby to prevent them from rocking or tilting, this particular construction of the cams being fully set forth in my U. S. Letters Patent No. 1,510,550, previously referred to. As the bars enter the threads on the screw 35 they are held from rocking or tilting due to the fact that the leading end or entrance to the thread groove is of a width corresponding to the thickness of the engaging ends of the bars. Stated another way, the entrance to the thread groove is not widened beyond the thickness of the bar, as has previously been the practice, so that the bar cannot rock in the threads, but is held firmly at either side.

In previously used constructions the end of the gill-screw is not reduced in diameter and consequently a relatively wide slot or opening must be formed in its surface to allow the end of the cams to pass therethrough. With the present improved construction the shank of the screw is reduced to an extent sufficient to let the cams pass thereacross, but at the same time sufficient stock remains so that the thread groove may be formed therein to an adequate depth to adapt it to engage the sides of the bar. Stated briefly, the thread extends into the reduced end of the screw so that it engages with the end of the faller-bar with a close fit to hold the latter from rocking. With the present type of machine employing two sets of fallers arranged with their teeth intersecting during the working stroke it is of utmost importance to prevent the bars from rocking, wobbling or canting at the beginning of their traverse as their teeth are liable to strike and be bent or broken. The bars are of themselves very costly to manufacture and when their teeth or pins become damaged they must be removed and replaced by others, entailing further expense and loss of production in the machine.

As each bar 38 is transferred from the bottom-screws 30 to the top screws 35 it is once more traversed forwardly along the saddles 57 and when this bar reaches a position opposite the end of the shorter screws 65 a bar 39 of the other set is transferred from the return screws 60 down into the threads of the screws 65 in cooperative relationship with the first-mentioned bar. That is to say, as the bars 38 travel outwardly toward the end of the screws 35 other bars 39 are transferred to the screws 65 to be traversed in the same direction with the teeth 95 projecting from the bars 38 in intersecting relationship with the teeth 96 of the bars 39 as clearly illustrated in Fig. 4 of the drawings. It will be understood that the threads of the feed screws 35 and 65 may be filled with bars, that is, the bars will be arranged in opposite series in close association. The threads on the screws 35 and 65 are of slight pitch as compared with those of the threads on the cooperating return screws 30 and 60 so that the bars are fed at relatively slow speed during their

working stroke and returned at a faster rate to be transferred back into the rearward ends of the screws 35 and 65.

It should be noted that the arrangement of the cams 83 on the return screws 60 is the same as that of the cams 77 on the bottom-screws 30, the ends of the cams 83 being adapted to pass across the reduced portions 84 of the screws 65 to carry the faller-bars down into centralized position with respect to the axes thereof; it being further noted that the leading end of the thread starts in the reduced portion 84 of the screw 65. The fallers 39 are therefore caused to begin their working stroke with their teeth 96 completely overlapping the teeth 95 on the bars 38 to secure the maximum efficiency of operation on the fibers throughout the whole length of traverse of the bars.

When it is desired to remove any or all of the faller-bars from the machine, as is frequently necessary in changing the character of the work or for repair or replacement of the teeth on the bars, the present improved arrangement provides for displacing one set of screws with respect to the other so that the bars can be lifted out. To open up the screws the clamping bolt 22 in each journal block 2 is unscrewed and the upper halves of the blocks, that is, the sections 4, are swung upwardly on their hinges 25 in the manner illustrated in Fig. 2 until the stops 28 and 29 come into engagement. It will be understood that as the two opposite hinged sections 4 of the journal blocks are swung open in this manner the faller-bars extending between the screws 60 and 65 at either side of the machine and resting on the opposite saddles 75 and 76 will be moved bodily upwardly with them. With the journal blocks open the bars 38 resting on the saddles 57 may be released from the threads of the screws 35 and readily lifted out of the machine, a whole group of bars being picked up or lifted in the hands at one operation. Such few of the bars as remain in the bottom-screws 30 are then transferred upwardly onto the saddles 57 and these are then lifted out of the threads of the screws 35 in a group in the same manner as above explained. To remove the bars 39 from the upper pairs of screws 60 and 65 the latter are turned to transfer the bars into the threads of the screws 60 from which they can be lifted out without impediment. It will thus be seen that while heretofore it has been required that each of the bars 38 in the bottom pairs of screws 30 and 35 must be taken out singly by rotating the screws, a very laborious and time-consuming operation, with the present arrangement the operation is made more convenient and performed much more expeditiously.

When the fallers or such of them as require replacement have been removed from the screws and replaced by others the machine is again set in operation by returning the upper sections 4 of the journal blocks 2 back into place. To accomplish this it is only necessary to swing the sections 4 down against the top of the lower sections 3, after which the bolts 22 are screwed down into place to secure the parts fixedly together. Care must be taken to return the upper sections of the journal blocks into place with the correct indexing of the gears 41 and 68 which, when the sections are open, are thrown out of mesh as shown in Fig. 2. To provide for this the ends of the journal blocks are marked with lines or gauge-marks 97 and 98, shown in Fig. 4. Before closing the upper sections 4 of the blocks against the lower sections 3 the screws 65 are turned to bring the edge of one of the cams 87 in register with the mark 97 on the upper block section 4 and the screw 35 is turned to register the edge of one of the cams 85 with the mark 98. It will be understood that the screws at both sides of the machine are set in this relationship before closing the blocks together whereby to insure that the gears 41 and 68 will be properly indexed to cause the cams to be timed for proper sequence of operation. Referring to Fig. 3 of the drawings, it is to be noted that the teeth on the gears 41 and 68 are formed with relatively sharp pointed ends so that they will more readily interengage when the upper block sections are brought down into place.

It will be observed from the foregoing that the present invention contemplates a novel construction and arrangement of the faller-screws in gill-drawing frames for providing a more efficient action of the teeth of the faller-bars on the material being worked or treated, while further providing an ingenious arrangement of the journals for the gill-screws whereby the pairs of screws in the opposite sets may be displaced or swung part to facilitate the removal of the faller-bars therefrom and their replacement therein.

While the invention is herein described and illustrated as embodied in a preferred form of construction, it is to be understood that various modifications may be made in the design and arrangement of the parts of the device without departing from the spirit or scope of the invention. Therefore, without limiting myself in this respect, I claim:

1. In a gill-drawing frame, the combination of a pair of cooperating gill-screws, means for rotating said screws, and a radially extending cam at the end of one screw for transferring the faller-bars into the threads of the opposite screw, said opposite screw being formed with a shank portion of less diameter than the outer periphery of its threads and of greater diameter than the root portion of the threads, the thread groove being extended into the reduced shank of the screw to adapt it to engage the sides of the faller-bar as

the latter is transferred by the cam to traverse it from the screw, whereby to prevent the bar from rocking or canting.

2. In a machine of the type specified, a pair of gill-screws arranged in opposite parallel relationship, means for rotating the screws, a radially extending cam at the end of one screw for transferring the faller-bars therefrom into the threads of the opposite screw, a cam at the end of the last-named screw for transferring the bars back to the first screw, the end of one screw having a shank portion of less diameter than the outer periphery of its threads and of greater diameter than the bottom portion of the threads with the end of the thread groove extended thereinto, and fallers arranged with their ends engaging the threads of the screws to adapt them to be traversed thereby, said fallers being transferred from one screw to the other by the cams with the cam on one screw turning past the reduced shank on the opposite screw to carry the faller into centralized position with respect to the last-named screw whereby its end will engage in the thread groove in the shank thereof to start its traverse while holding the faller from canting or rocking.

3. In a gill-drawing frame, the combination with the faller-bars thereof, of a top-screw having relatively fine threads for traversing the faller-bars during their working stroke, a bottom-screw having coarser threads for returning the fallers in the opposite direction, a cam at the end of the top-screw for transferring the faller-bars therefrom into the threads of the bottom-screw, and a cam at the end of the bottom-screw extending radially therefrom with its end reaching beyond the periphery of the threads on the top-screw, said top-screw being reduced in diameter at a point opposite the cam but of greater diameter than the bottom of its threads and with the end of the thread groove extended thereinto, whereby as a faller is lifted by the cam it is centralized with respect to the axis of the top-screw to engage its end with the thread groove in the reduced portion thereof to hold it from canting or rocking at the start of its traverse.

4. A gill-screw having a shank-portion of less diameter than the periphery of its threaded portion and of greater diameter than the bottom of its threads with the end of the thread groove extending thereinto, a cooperating return screw having a radially extending cam at one end arranged opposite the shank of the first screw and adapted to turn past said shank in close association with the periphery thereof, and a faller-bar having its ends fitted closely to the sides of the thread grooves in the screws and adapted to be transferred from one screw to the other screw with its end engaging the groove in the shank-portion thereof to prevent it from rocking or canting as it starts its traverse.

5. An improved construction of gill-screw having a threaded portion of predetermined diameter and a shank portion of less diameter with the thread-groove of its larger portion continued into its reduced shank portion to form relatively shallow threads therein.

6. An improved construction of gill-screw having threads at one end and a reduced shank extending in an axial direction from its threaded portion, said shank being of greater diameter than the root portion of the threads on the screw and of less diameter than the periphery of its threaded portion and having threads therein forming a continuation of its main threads.

In testimony whereof I hereunto affix my signature.

WILLIE HOLDSWORTH.