June 12, 1928. 1,673,407

W. HOLDSWORTH

GILL DRAWING MACHINE

Filed Dec. 1, 1925 2 Sheets-Sheet 1

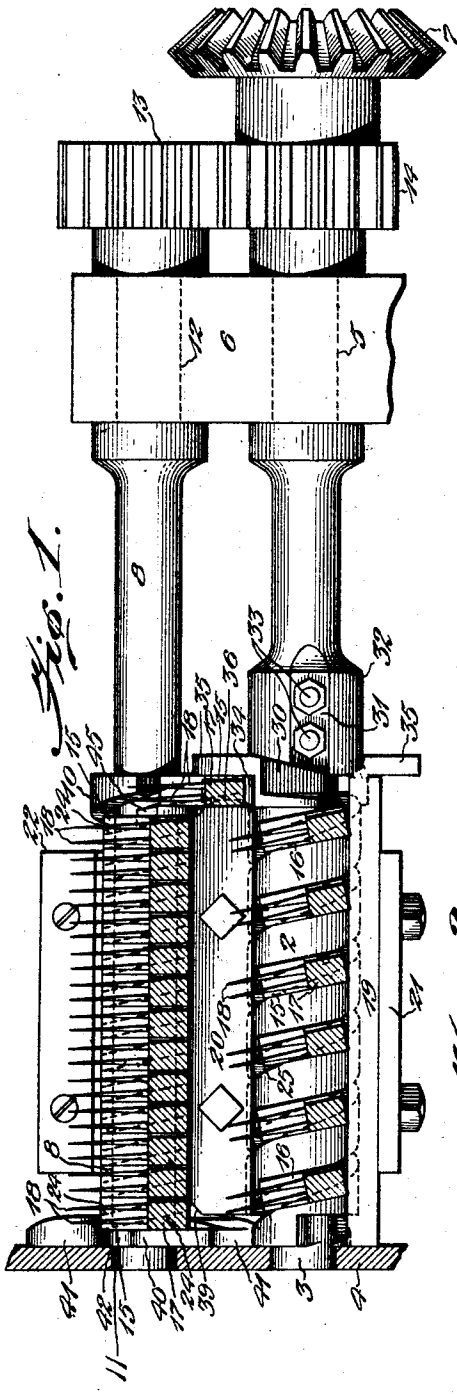


Fig. 1.

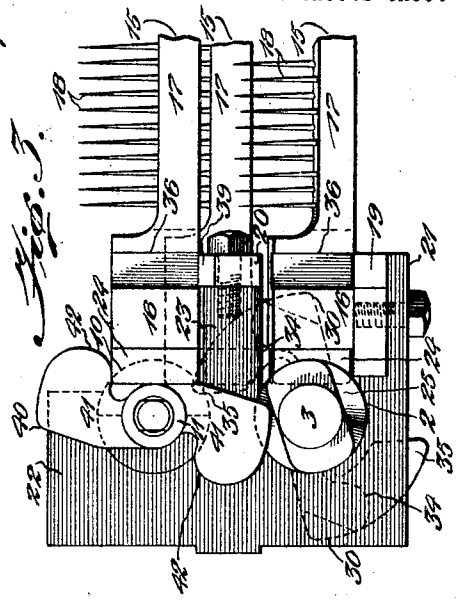


Fig. 3.

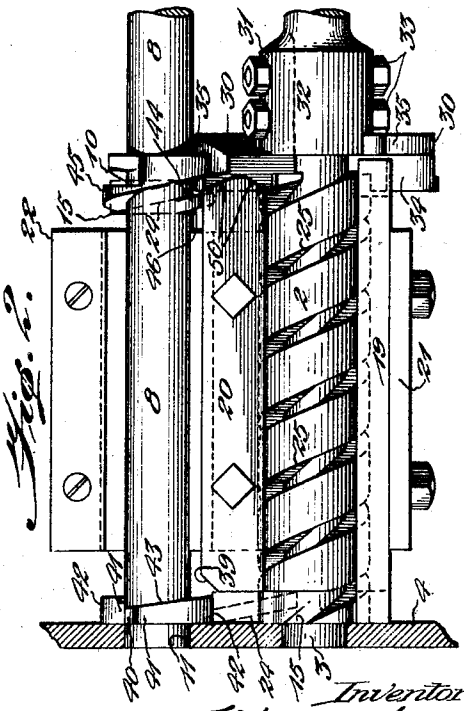


Fig. 2.

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2 Sheets-Sheet 2

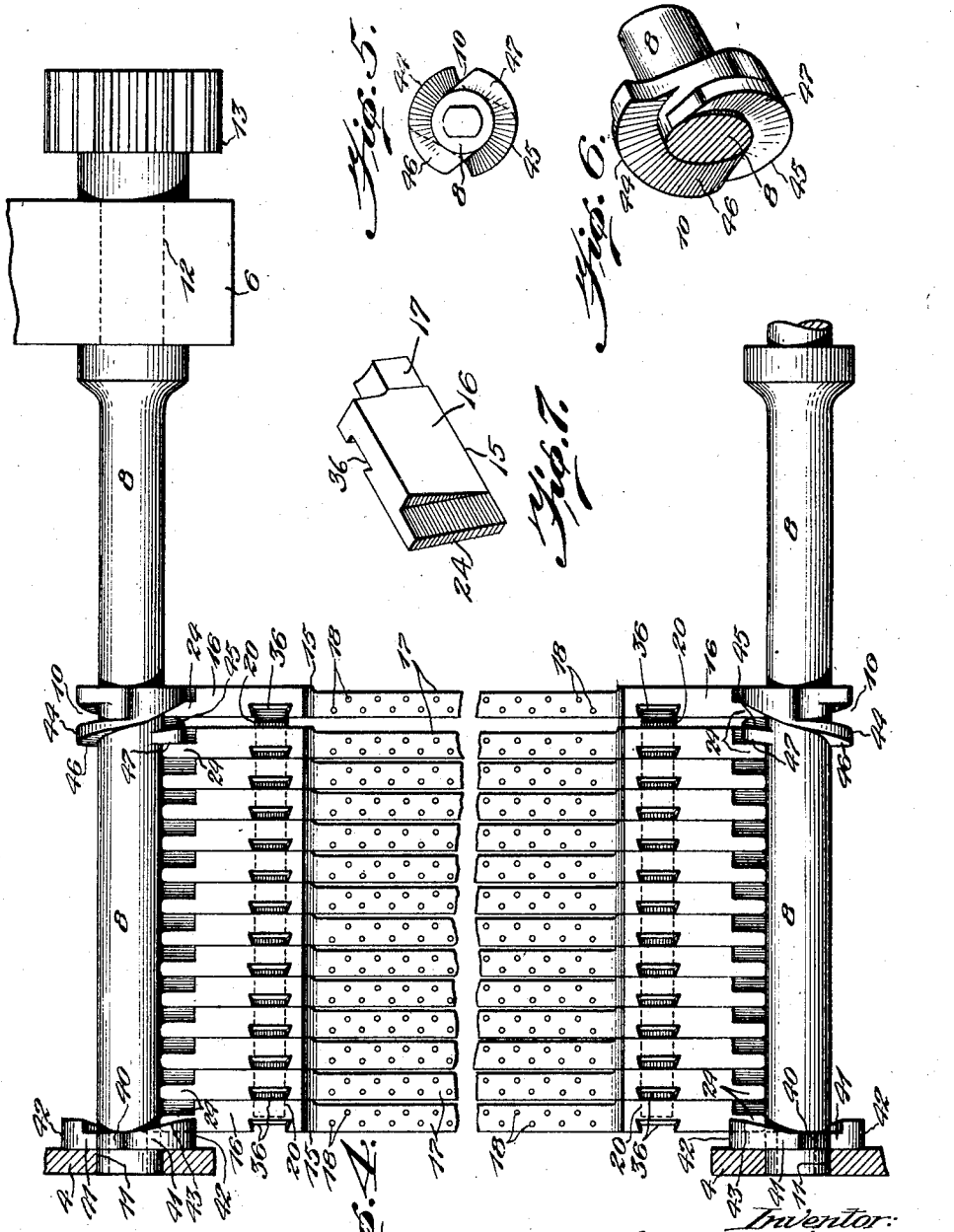


Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

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UNITED STATES PATENT OFFICE.

WILLIE HOLDSWORTH, OF PROVIDENCE, RHODE ISLAND.

GILL-DRAWING MACHINE.

Application filed December 1, 1925. Serial No. 72,555.

This invention relates to gill-drawing frames or the like and consists of improvements in the means for traversing the gill-bars or fallers which act to comb the fibers passing through the drawing-rolls of the machine.

One object of the invention is to provide a traversing-mechanism for the faller-bars which eliminates the use of expensive top-screws, or both the top- and bottom-screws if desired, and which operates with greater efficiency and better results than with the usual screws.

Another object of the invention is to provide a faller-traversing mechanism which may be employed with interchangeable sets of bars of different thickness to obtain a varying pitch or ratio between the teeth on the bars whereby to adapt the machine to a wider range of work in accordance with the quality and length of the fibers to be drawn.

Another object of the invention is to provide a faller-traversing mechanism which permits the bars to be removed and replaced by others of different pitch without dismantling the machine or removing or altering any of its operating elements.

Another object of the invention is to provide a faller-traversing mechanism in which the bars are subjected to less strain and wear and wherein all of the operating parts are rendered more durable.

Another object of the invention is to provide a faller-traversing mechanism in which the bars are more compactly arranged, whereby they cooperate to brace and reinforce each other during their traverse to secure a steadier pin-field operating on the material.

Another object of the invention is to provide a faller-traversing mechanism in which the bars are raised into operative position with a straight line movement without canting or rocking, whereby their teeth or pins are properly projected between the fibers being operated upon without raising or bunching the material above the pin-field.

Another object of the invention is to provide a faller-traversing mechanism which is simpler in construction and more economical to manufacture, less susceptible to wear or breakage, and less liable to derangement than similar devices heretofore employed in the art.

Further objects of the improvement are set forth in the following specification which describes a preferred embodiment of the invention as illustrated by the accompanying drawings. In the drawings:

Fig. 1 is a view showing the improved faller-traversing mechanism at one side of the drawing-frame and illustrating the faller-bars in cross-section;

Fig. 2 is a similar view showing the traversing-mechanism in a slightly different position and with the fallers removed;

Fig. 3 is an end view of the traversing-mechanism illustrated in Fig. 1, shown with the end-plate or bearing-member removed to more clearly illustrate the operating parts;

Fig. 4 is a plan view of the traversing-means at both sides of the drawing-frame, showing the fallers extending therebetween;

Fig. 5 is an end view of the upper shaft or spindle of the traversing-means and the propeller-cam thereon;

Fig. 6 is a slightly enlarged perspective view of the propeller-cam; and

Fig. 7 is a perspective view showing the beveled or inclined end portion of the faller-bar.

A particular and important object of the present invention to provide a means for traversing the gill-bars or fallers in the machine without the use of the top-screws or, if desired, without the use of either the top- or bottom-screws; and further to render the traversing-means adaptable for the interchange of the fallers of different types without adjustment or alteration in the mechanism of the machine. To attain this end, while providing other advantages as previously noted, my improved faller-traversing device employs certain principles as next explained and may be embodied in a mechanism which will now be set forth by way of example as illustrative of the invention.

Referring to the drawings, in the present embodiment of the invention I have preferred to illustrate the faller-traversing mechanism as employing the usual bottom-screws for propelling the fallers during their inoperative or return stroke; the purpose being to lessen the number of bars required in the machine, as will hereinafter appear. As shown in Figs. 1 and 2 of the drawings, the bottom-screws 2 are of usual construction and extend horizontally be-

tween suitable bearings in the drawing-frame. At their forward ends the screws 2 have reduced portions 3 projecting through bearings in the end-plate 4, while their rearward ends have reduced portions 5 journaled in uprights 6. The bottom-screws on opposite sides of the machine are driven from bevel gears 7, see Fig. 1, which mesh with suitable gears on the driving-shaft of the machine, not herein shown.

In place of the usual top-screw as generally employed with each bottom-screw my present improvement contemplates the use of a straight spindle or shaft 8 having a cam 10, to be later more specifically described, for propelling the series of faller-bars through their operative stroke or traverse. The spindles or shafts 8 are journaled in the same bearings as ordinarily provided for the top-screws, so that they may replace the top-screws without alteration or adjustment in the parts of the machine, thus making them universally adaptable for practically all types of gill-drawing frames. As shown in Fig. 1, each spindle 8 has an end-bearing 11 in the end-plate 4, while being journaled at its opposite end in a bearing 12 in the upright 6, above the bottom-screw 2. At this end of the spindle 8 is a spur-gear 13 meshing with a similar gear 14 on the bottom-screw 2, whereby the spindle is driven from the bottom-screw in the reverse direction of rotation.

The gill-bars or fallers 15 are substantially the same in structure as generally used, while embodying certain improvements as later explained. Each bar comprises end-portions 16 of definite thickness, between which extends a narrower strip or bridge-piece 17 drilled with holes for receiving the teeth or pins 18 which project upwardly therefrom, see Figs. 3 and 4. As indicated in Figs. 1 and 4, the bridge-portions 17 of the bars are of less thickness laterally than the end-portions 16, the object being to provide that when the bars are assembled in close relation for operation upon the material in the machine a space will intervene between each pair of bars along their pin-holding length for the collection of dirt, dust, or short fibers, which are thus allowed to sift down through the bars. The bars 15 are preferably reduced in thickness on their rearward sides so that their pins will be set forward to adapt them to be brought as close as possible to the front drawing-roll of the machine during their operative traverse.

The enlarged ends 16 of the bars 15 slide on horizontal strips or saddles 19 and 20 during the opposite traverse motion of the bars in the machine. As shown in Fig. 3, the ends of the bars 15 rest on the bottom-saddles 19 during their rearward traverse through the threads of the bottom-screws 2; while the top-saddles 20 support the bars in their elevated position to be slid therealong during their forward operative stroke. The bottom-saddle 19 is bolted to a ledge 21 forming a part of a block or member 22 projecting from the framework of the machine and the top-saddle 20 is bolted to a rest 23 on the same block. The terminal-portions 24 of the bars 15 are thinned down and beveled off at an angle, as indicated by the dash lines at the left in Fig. 2, to adapt them to conform to the inclination of the driving face of the propeller-cams 10 on the spindles 8. The bars are maintained erect during their traverse in the top stroke, but they may cant or tilt slightly during the inoperative stroke as it is the usual practice. It is essential, however, that the bars be sustained in upright or vertical position during their operative stroke so that their pins will not be inclined with respect to the fibers being acted upon. In fact, this is an important consideration to obtain the proper and efficient functioning of the fallers, and the present improved traversing-mechanism is particularly designed to effect this desired result.

It will be understood that the faller-bars 15 are traversed from the forward end of the bottom-screws 2 rearwardly along the bottom-saddles 19, and when they reach the end of the threads in the bottom-screws they are transferred upwardly to the top-saddles 20. The lifting or transferring of the bars is accomplished through the action of the bottom faller-cams 30, which may be of usual construction as shown in Fig. 3. As herein illustrated, the bottom faller-cams 30 comprise radial arms formed with foot-pieces 31 set into slots in the hubs 32 of the bottom-screws 2, see Fig. 1, and secured in place by means of suitable bolts and nuts indicated at 33. In the present illustration of the invention the bottom-screws 2 are shown as having double threads, and consequently two faller-cams are employed on each screw, arranged with their arms extending in diametrically opposite directions. At the outer ends of the cam-arms are rounded protuberances 34, see Fig. 3, each of which forms a cam-nose for insertion in under the ends of the faller-bars to lift the latter upwardly onto the top-saddles 20. The preferred type of faller-cam, as herein shown, has a guiding-fin or flange 35 extending circumferentially forward of the cam-nose 34 and offset laterally in relation thereto to adapt it to engage the side of the faller-bars 15 to support and guide the latter as they are raised by the cam, see Fig. 1. The type of faller-cam above referred to is illustrated and described in my U. S. Letters Patent No. 1,510,550, dated Oct. 7, 1924.

The ends 16 of the faller-bars 15 are grooved or slotted on the side at 36, see Figs.

3 and 4, the groove being fitted to the end of the top-saddle 20 and acting as a spline or guideway therefor to steady the bar as it is lifted up onto the top-saddle 20. The end of the top-saddle 20 which guides the bar during its upward movement is beveled off at 50 on its upper and lower sides, see Fig. 2, to adapt the faller-bar to be displaced laterally in one direction or the other as it slides across the end of the saddle. This slight displacement of the bar takes place during its exit from the thread-grooves on the bottom-screws and during its entrance into the traversing-mechanism which propels it through its operative stroke, this operation being more fully described hereinafter. The opposite end of the top-saddle 20 is also cut away or beveled off at 39 to adapt the faller-bars to start downwardly at the end of their traversing movement just before they reach the end of their operative stroke.

The bars 15 are transferred from their upper position downwardly into the threads of the bottom-screws 2 by means of upper faller-cams 40, which may be of any usual construction. As illustrated in Fig. 3, the upper faller-cams 40 are attached to the outer end of the spindle or shaft 8 and comprise opposite radial arms 41, each formed at its outer end with a rounded protuberance or cam-nose 42. It will be noted from Fig. 2 that the inner side-face of the cam-arm 41 is beveled off or inclined slightly at 43 in accordance with the inclination of the terminal-portions or fins 24 on the ends of the faller-bars 15, and also corresponding substantially to the pitch or inclination of the faces 46 on the propeller-cam 10. The object of this is to provide a clearance for the first bar in the series being fed along the top-saddle 20 while the next preceding bar is being carried down across the end of the saddle as illustrated by dash lines in Fig. 2.

The propeller-cam 10, before referred to as the means for propelling or traversing the fallers in their operative stroke, and which forms an essential feature of the present invention, is shown in detail in Figs. 5 and 6. This element may take other forms than that herein illustrated, but preferably it is constructed of generally circular shape and provided with radially-opposite lobes 44 and 45. The lobes are shaped with helically inclined cam-faces 46 and 47, respectively, extending through approximately one-hundred-and-fifty degrees of the circumference. The cams 10 may be constructed integral with the spindles 8, or they may be made separate therefrom and secured thereto by means of keys, set-screws, or any other suitable construction.

As each faller-bar 15 is transferred upwardly across the end of the top-saddle 20 its inclined terminal-portion or fin 24 comes into engagement with one or the other of the lobes 44, 45 of the cam 10 during the rotation of the latter with the spindle 8. The inclined face 46 or 47 of the cam will thus act to cause the bar to be urged toward the left, as viewed in Fig. 1, and as the cam continues to rotate this particular bar will be transferred onto the top-saddle 20 and its propulsion continued along the top of the saddle. It will be understood that the bars feed out of the double threads of the bottom-screws at each half revolution of the latter so that they enter into engagement with the cams 10 on the opposite sides of the machine in the same ratio, with first one lobe of the cams and then the other acting on the successively lifted bars. Now, as the bottom-screws 2 and upper-spindles 8 are continuously rotated the faller-bars will be individually transferred from the bottom-screws up on to the top-saddles 20 and will be fed into place one after another to provide a continuous series, to which is imparted a traverse motion in accordance with the pitch or inclination of the cam-faces 46 and 47. The method of operation of the complete mechanism is as next more fully explained:

In preparing the machine for operation a set of faller-bars is selected in accordance with the quality and length of fibers to be operated upon. For example, with bars of ½ inch thickness the pins or teeth 18 on the bars, which are usually disposed alternately in double rows, will be spaced ½ inch apart longitudinally of the fibers. For shorter fibers a narrower bar is used, say, for instance, a bar $\frac{7}{16}$ or ⅜ of an inch thick, and in some cases the range may extend from a ¾ inch down to a ¼ inch bar. In placing the bars in the machine they may be taken in groups of six or eight and simply laid on the top-saddles 20 to extend across between the spindles 8 in the relation shown in Fig. 4. After the space on the top-saddles has been filled with fallers the spindles 8 are turned by hand to transfer the bars down into the threads of the bottom-screws 2, new bars being added either singly or in groups until the whole mechanism is filled with bars, as illustrated in Fig. 1. As shown in this view, there are thirteen bars on the top-saddles 20, six bars in the bottom-screws 2 and one bar in transit between the bottom-screws and the traversing-mechanism on the spindles 8. With this arrangement twenty bars are employed in the machine, the pin-field being substantially seevn inches long and each bar one-half inch in thickness, so that the space between the teeth, called for convenience the pitch, is one-half inch.

For a finer pitch I may use twenty-two bars of $\frac{7}{16}$ inch thickness with sixteen in the upper row and six in the bottom-screws as before; and for a still finer pitch I may

use bars of 3/8 inch thickness, requiring twenty-four bars in all with eighteen in the upper row and six in the bottom row as before. I have determined that a single type of propeller-cam 10 will act efficiently to traverse these several sets of bars of varying thickness or pitch, but to extend the range I may use a slightly different type of propeller-cam if required. For example, I may use bars of $\frac{5}{16}$, $\frac{5}{32}$, or 1/4 inch thickness for pitches within this range, or I may use sets of bars of 3/4, $\frac{11}{16}$, and $\frac{9}{16}$ inch thickness with a slightly different form of cam to obtain the various pitches in a coarser range.

After the fallers have been placed in the machine in the manner as above described the improved faller-traversing mechanism may be operated continuously to propel the bars forwardly on the top-saddles during their operative stroke, while returning them through the threads of the bottom-screws to be repeatedly transferred upwardly into engagement with the propeller-cams 10 which act as the single means for feeding the bars in their operative stroke in the manner as previously explained. It will be understood, of course, that as each bar is elevated into engagement with the cams 10 it is carried forward against the next preceding bar, so that a continuous thrust is maintained on the whole row or series of bars resting on the top-saddles 20. This steady and continuous thrust on the rearward bar of the series maintains all of the several bars with their ends 16 in closely abutting relation, so that each bar acts to brace and stiffen its neighbors to prevent rocking, canting, jumping, or other unwarranted displacement of the bars. In this way I secure a much smoother and more positive action of the bars, resulting in a steadier pin-field operating on the fibers passing through the drawing-rolls of the machine. Stated briefly, the gill-teeth or faller-pins will have a steady, uniform motion, without any tendency to chatter or vibrate to disturb the fibers or throw them out of alinement, so that a more uniform combing action is obtained which prevents injury to the fibers and materially improves the product of the machine.

Moreover, as the bars are in close contact along their ends the propulsive thrust is much closer to the pin-field, so that the bars will have less tendency to buckle or spring, as is the case when screws are employed to apply the thrust on the outermost beveled ends of the bars. It is also particularly to be noted that the faller-bars are lifted from the bottom-screws and transferred into engagement with the propeller-cams 10 without any tendency for them to rock or cant out of a vertical position. The teeth or pins in the bars are therefore caused to cleave between the fibers with a clean action without any tendency for them to catch under the material to pry or lift it up, as is the case where the teeth come into contact with the fibers in a canted or tilted relation.

It has before been noted that while I have preferred to herein illustrate the invention as embodying the use of the usual bottom-screws, it is perfectly feasible to eliminate the bottom-screws as well as the top-screws. That is to say, the improved propeller-cams 10 may be employed on bottom-spindles for propelling the bars in their return stroke. However, in such case a greater number of faller-bars are required in the machine, since those in the lower row must be arranged in close juxtaposition with their sides abutting. Moreover, as the bottom-screws act only to traverse the faller-bars in their return stroke, while they are inoperative, there is less wear on the screws and on the bars during this traverse and therefore the elimination of the bottom-screws is not so important. On the other hand, by eliminating the top-screws and substituting the straight spindles 8 with the propeller-cams 10 as herein described, I not only save the cost of the screws, but adapt the machine to a wider range of work without alteration or adjustment in its mechanism, the bottom-screws remaining the same for all pitches in a given range.

It has been explained that the present improved traversing-mechanism is adapted for the interchange of the bars to provide a much wider range in the drawing of different qualities and lengths of fibers. The different sets of faller-bars may be substituted one for another very readily and expeditiously and no other change in the mechanism is required except in certain cases to change the gears which regulate the draft ratio in the machine.

The elimination of the top-screws relieves the faller-bars of very considerable wear, to which they are ordinarily exposed in the continuous threads of the screws. With the present improved traversing-mechanism all sets of fallers of whatever thickness are constructed with their beveled ends of the same inclination and size and, being designed for the coarsest predetermined range of pitches, the thinner bars are much stronger than usual while the process of manufacture of the bars is rendered much simpler.

The propeller-cams may be made either single or double lobed in accordance with the type of bottom-screws being employed, or they may be of other form and construction in conformity with particular requirements.

This form of construction of the faller-bars with their abutting ends of greater thickness than their central portions provides a space between the bars for the sifting through of waste and dirt between clean-

ing periods, thus avoiding the collection of lint, fluff, or short fibers on the teeth of the bars. At the same time, the bars are so designed as to bring their pins close to the front drawing-rolls during their forward traverse in the machine.

My improvement also provides that the cams and bars may be standardized within a limited range to meet practically all requirements, thus avoiding the wide range of types and sizes of gill-screws and bars as now used. The invention is applicable to practically all types of drawing-frames and therefore the usual complication in manufacture is avoided, while the range of operation of the machine is extended.

A considerable saving in cost of manufacture is accomplished through the elimination of the expensive screws and the standardization of the fallers; and furthermore, the capital investment in the mill or plant using the machines is reduced since it is not required to carry several types of screws in reserve.

While I have preferred to illustrate the improved device as applied to a particular type of machine and as employing the usual bottom-screws, it is to be understood that the spirit and scope of the invention extend beyond the present embodiment, and that therefore I do not wish to be limited to the precise form and construction as herein shown and described.

I claim:

1. In a gill-drawing machine, the combination of a plurality of faller-bars arranged in contacting engagement in series, and means acting only on the end bar in succession in the series to traverse the bars in the machine.

2. In a gill-drawing machine, the combination of a plurality of faller-bars arranged in abutting relation with their sides in contacting engagement, and means for exerting a thrust successively on the end bar only in the series to propel the other bars during their traverse.

3. In a gill-drawing machine, the combination of a plurality of contacting faller-bars arranged in contacting engagement in series, and a cam for acting successively on the end bar only in the series to impart a traverse motion to the other bars of the series.

4. In a gill-drawing machine, the combination of a plurality of travelling faller-bars arranged in contacting engagement in series, and means acting on the opposite ends of the rearmost bar only in succession in the series to traverse the whole series of bars.

5. In a gill-drawing machine, the combination of a plurality of travelling faller-bars arranged in contacting engagement in series, means for displacing the bars from one end of the series and replacing them at the opposite end, and means for exerting a thrust against the end bar only in the series to impart a continuous traverse motion to the bars.

6. In a gill-drawing machine, the combination of a plurality of faller-bars arranged in contacting engagement in series, means for displacing the bars from one end of the series and replacing them at the opposite end, and a cam acting on the end bar only in succession as it is replaced in the series to propel the whole series of bars to impart a continuous traverse thereto.

7. In a gill-drawing machine, the combination of a plurality of faller-bars arranged in alinement with their sides in contacting engagement, a cam for exerting a thrust on the end bar only in succession to slide the whole series of bars, and means for transferring the bars from the forward to the rearward end of the series to successively engage them with the cam.

8. In a gill-drawing machine, the combination of opposite parallel rotating shafts, a plurality of faller-bars extending between the shafts and arranged in contacting engagement, and cams on the shafts acting only on the rearmost bar in succession in the series to propel the whole series of bars longitudinally of the shafts.

9. In a gill-drawing machine, the combination of opposite parallel rotating shafts, a series of faller-bars extending between the shafts and arranged in contacting engagement, means to displace the bars from one end of the series and replace them at the other end, and cams on the shafts for acting on only the end bar in succession as it is replaced in the series to propel the bars forward in a continuous travel.

10. In a gill-drawing machine, the combination of opposite rotating shafts, a series of faller-bars extending between the shafts and arranged in contacting engagement, propeller-cams on the shafts acting successively on the rearmost bar only of the series to propel the bars forward, faller-cams at the forward ends of the shafts for transferring the bars downwardly, means to travel the bars rearwardly, and means to transfer the bars upwardly at the end of their rearward travel to successively carry them into engagement with the propeller-cams.

11. In a gill-drawing machine, the combination of a plurality of faller-bars arranged to slide in a row, means acting successively against the rearmost bar only in the row to propel the whole series of bars forward, and means to remove the bars individually from the forward end of the series at the end of their traverse and to successively replace them in engagement with the propelling-means.

12. In a gill-drawing machine, the com-

bination of a plurality of faller-bars arranged in contacting engagement, saddles for supporting the ends of the bars to adapt them to slide thereon in a row, means acting successively on the end bar only in the row to slide the whole series of bars, and means to successively transfer the bars from the forward to the rearward end of the series to maintain a continuous travel of the bars.

13. A traversing-mechanism for the faller-bars of gill-drawing machines comprising in combination with a plurality of the bars arranged in contacting engagement, of means for supporting the bars in a row, and helical cams acting successively on the end bar only in the row to propel the whole series of bars forward.

14. A traversing-mechanism for the faller-bars of gill-drawing machines comprising in combination, interchangeable sets of faller-bars of different thickness, means for supporting the bars of each set in abutting relation and contacting engagement in a series, and means adapted to act successively on the end unit only of a set of bars to traverse the whole series of bars in the machine.

15. In a gill-drawing machine, the combination of propeller-cams, interchangeable sets of faller-bars arranged in contacting engagement in series to be traversed by the engagement of the rearward bar only with the cams, and means for transferring the bars from the forward end of their traverse rearwardly into position to be successively operated upon by the cams.

16. In a gill-drawing machine, the combination of a plurality of faller-bars arranged in contacting engagement in series, means acting successively against the end bar only of the series to traverse the bars in the machine, bottom-screws for returning the bars from the forward end of their stroke back to the traversing-means, and means for transferring the bars to the bottom-screws and from the bottom-screws to the traversing-means.

17. In a gill-drawing machine, the combination of a pair of opposite shafts, helical cams on the shafts, saddles adjacent the shafts, and a plurality of faller-bars extending between the saddles and arranged in contacting engagement with the endmost bar only engaged by the cams to adapt them to exert a thrust on the bars.

18. In a gill-drawing machine, the combination of faller-bars arranged in series and provided with end portions of definite thickness disposed in contacting engagement, and means acting successively against the end bar only of the series to traverse the several bars in the machine, said bars having intermediate sections of reduced thickness extending between their end portions and carrying pins therein so that when the bars are in operative position spaces will intervene between the pin-bearing sections to permit lint and dirt to be discharged therethrough.

19. In a gill-drawing machine, the combination with the horizontal saddles thereof, of a plurality of faller-bars extending between the saddles with their ends supported thereon, said bars having end portions of definite thickness arranged in contacting engagement, and means acting successively on the end bar only of the series to slide all of the several bars along the saddles, said bars having pin-bearing sections extending between their end portions flush with the forward side of the bars and recessed on their rearward side whereby when the bars are assembled in series with their ends in contact a space will intervene between the rearward side of one bar and the forward side of the next bar in the manner and for the purpose specified.

In testimony whereof I affix my signature.

WILLIE HOLDSWORTH.