2 Sheets—Sheet 1.

J. BULLOUGH.

MACHINE FOR SIZING AND BEAMING YARN.

No. 187,597. Patented Feb. 20, 1877.

Fig. 1.

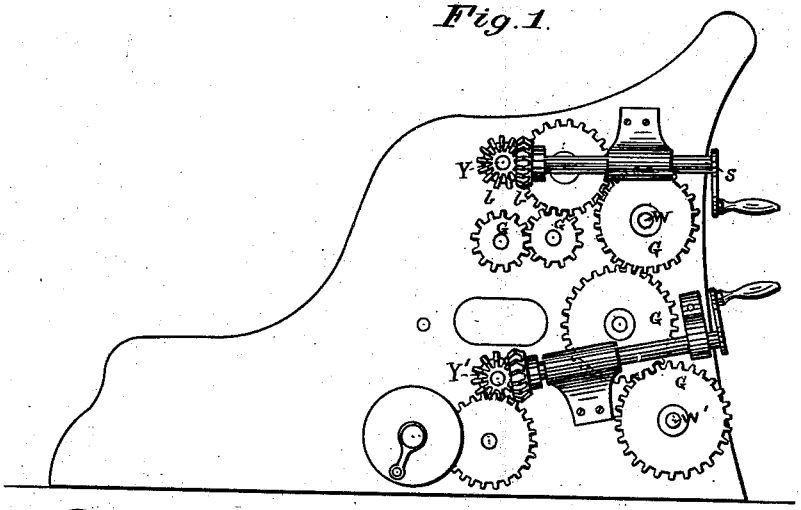


Fig. 2.

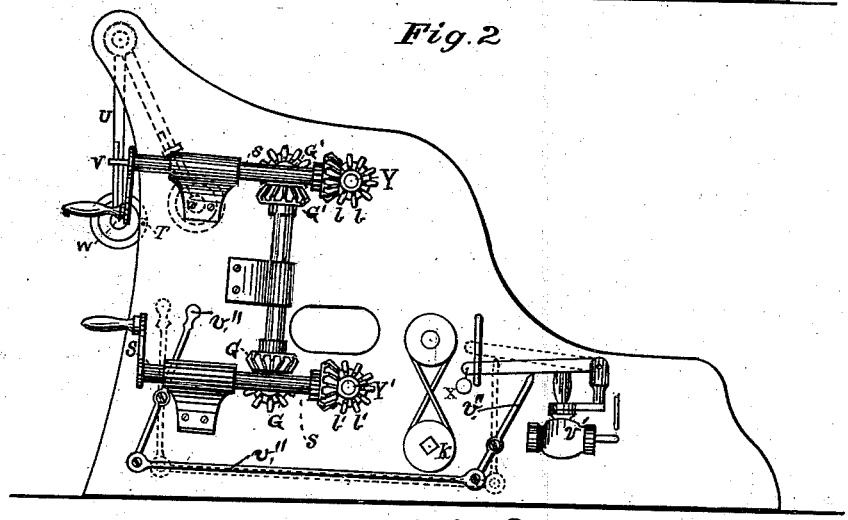
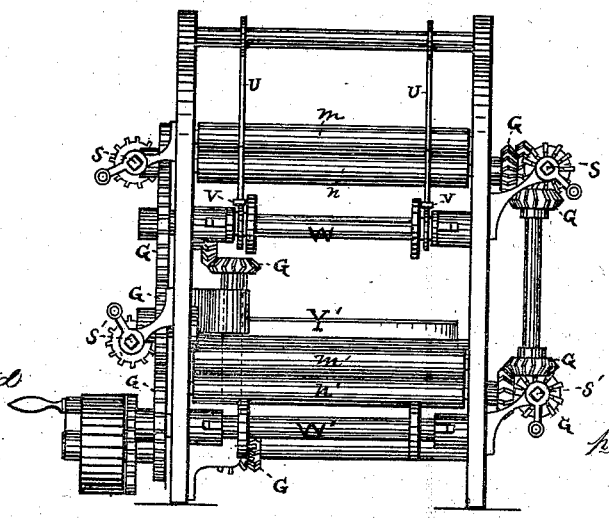


Fig. 3.



Witnesses

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2 Sheets—Sheet 2.

J. BULLOUGH.

MACHINE FOR SIZING AND BEAMING YARN.

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Fig. 4.

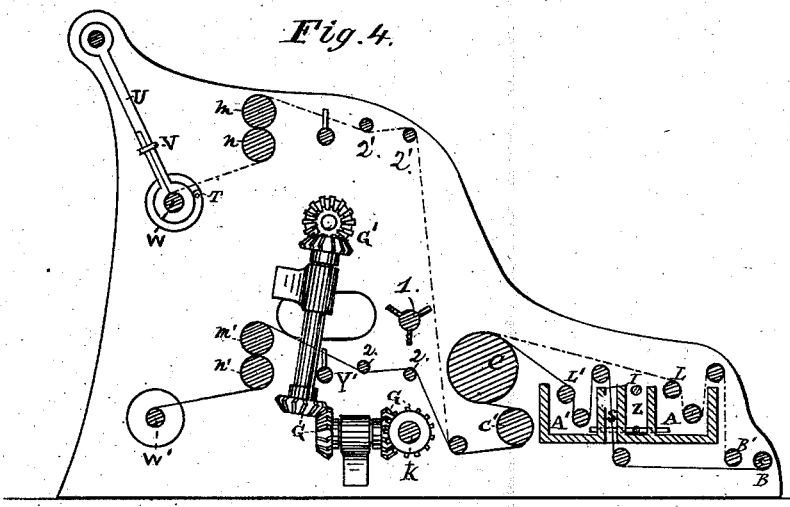


Fig. 6.

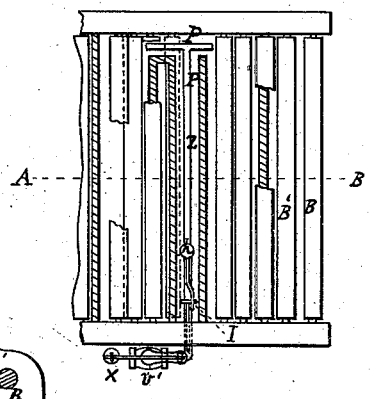


Fig. 5.

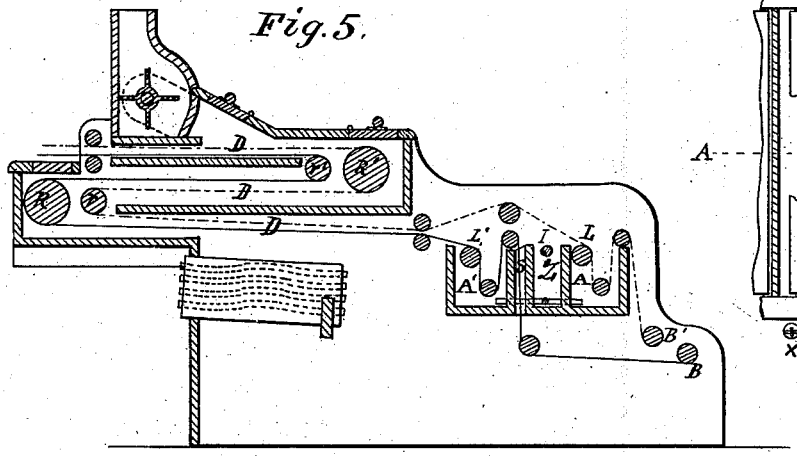


Fig. 7

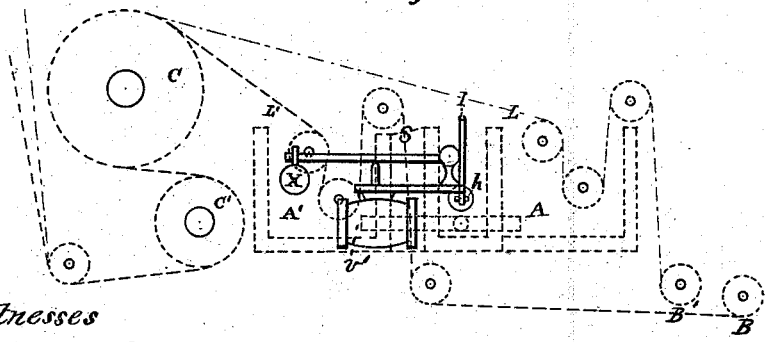
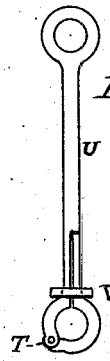


Fig. 8



Witnesses
Pennington Halsted
W. R. Edelen.

Inventor
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per J. J. Halsted
his Atty.

UNITED STATES PATENT OFFICE.

JOHN BULLOUGH, OF ACCRINGTON, ENGLAND.

IMPROVEMENT IN MACHINES FOR SIZING AND BEAMING YARN.

Specification forming part of Letters Patent No. **187,597**, dated February 20, 1877; application filed October 19, 1876.

To all whom it may concern:

Be it known that I, JOHN BULLOUGH, of Accrington, in the county of Lancaster, England, have invented certain new and useful Improvements in Machinery for Sizing and Beaming Yarn, (patented in England November 8, 1873, and numbered 3,648;) and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification, and in which—

Figure 1 is a side elevation of a machine embodying my invention, showing the gearing which actuates the mechanism; Fig. 2, a side elevation at the opposite side to Fig. 1; Fig. 3, an end view; Fig. 4, a longitudinal vertical section; Fig. 5, a similar section when a heating-chamber is used; Fig. 6, a partial plan view, showing the size-boxes, automatic float, and the steam heating apparatus; Fig. 7, a detail (enlarged) of the steam-supply regulator and float; and Fig. 8, a detail, showing one of the swinging arms for doffing the warp-beams.

The object of this invention, which I call a "double sizing-machine," is to enable two weavers' beams to be sized and wound on simultaneously, instead of only one, as heretofore.

To accomplish this successfully, the two sets of yarn must be kept separate and distinct as far as possible, so that, if an end is lost or a lapper forms, the operative may not be in doubt as to which set of yarn it belongs to. It is also necessary to contrive a double size-box, A A′, which will correspond to the two sets of yarn, but which will not require more attention on the part of the sizer than the ordinary single size-box; for if extra attention were required here it would render it impracticable for one man to tend the machine. It is also most essential that the two sets of yarn in passing through the machine should travel at exactly the same speed, and should have exactly the same stress or tension. Finally, something to facilitate and expedite the operation of "doffing," or taking full beams out and putting empty ones in, must be devised in order to bring the work of running a double machine within the capability of one man.

These objects are attained in the following manner: A double creel or back-beam holder is placed behind the size-box A A′, furnished with a double set of back beams, B B′. The front set of beams, B′, or the set nearest the size-box, is the same in all respects as in an ordinary single sizing-machine, and the yarn is conducted in the usual way into the size-box A; thence onto the cylinders C C′, if it is a cylinder-machine; or into the drying-chamber D, if it is an air-drying machine. The yarn from the second set of beams, B, is conducted under the first set and under the first half of the double size-box A; then upward and between the two halves of the double box, a space, S, being left between the two halves of the box for this purpose, and finally into its own division A′ of the box. Emerging from its respective division of the double box each sheet of yarn passes onto the cylinder C, if a cylinder-machine, and here, for the first time, the two sheets come together. Together they remain till they leave the drying-cylinders; then each sheet again takes its own course, the lower sheet being conducted through the lower half of the double head-stock, and the upper sheet being conducted to the upper half of the head-stock.

Thus it will be seen that wherever there is a liability of the threads breaking, the two sheets are separate and distinct, and the two sets of threads cannot give or take from each other.

Only on the cylinders C C′ are they in contact, where the liability to break is so small and of such rare occurrence that no practical evil can result from it. But a great good results from both sets of yarn coming together on the cylinders. They have a double power to pull the cylinders around, and only half the usual strain is put on each thread. Also, the surface of the cylinder is more completely covered by the two sets than by one only, and consequently there is less waste from radiation. But when the machine is of the kind called air-drying (Drawing No. 5) the two sheets of yarn, on emerging from their respect-

ive divisions A A′ in the size-box, enter the drying-chambers D separately, and may remain apart all through, if deemed necessary. In such a case two sets of conducting-rollers, R R′ *r r′*, would be necessary—that is to say, where there is in ordinary machines but one roller in the chamber, another, R R′, of somewhat larger diameter, would be placed behind it, but their centers would be in the same line. In this way the sheet of yarn conducted round the rollers R *r′* would be outside the sheet conducted by the set of rollers *r* R′. But it is not believed that it will be found necessary to keep the two sheets of yarn separate in the drying-chamber any more than it is on the cylinders, especially if one or both sheets of yarn, on emerging from the size-box, or before they come together, is or are caused to rub over a surface which will lay the fibers, and the fibers of either or both of the sheets, being so smoothed down and set before coming in contact, will not interlock, and the two sheets will be found to separate perfectly. In the cylinder-machine the two sets of yarns are dried by a single fan, 1, (see Fig. 4,) located with reference to the cylinder C, and the guide rods or rolls 2 2 2′ 2′, substantially as shown, so that one fan may serve to blow at the same time both sets of yarns. Just before passing onto the weavers' beams W W, the sheets of yarn are caused to pass one between two rollers, *m n*, the other between rollers *m′ n′*. The bottom rollers *n n′* in these two pairs are driven at one uniform speed by positive gearing G from the first driving-shaft K, and by similar positive gearing G′. These two bottom rollers *n n′* are to have a velocity coinciding with the two copper rollers in the size-box A A′, so that if the number of revolutions of the two bottom rollers *n n′* be reduced or increased, the speed of the two copper rollers L L′ is reduced or increased in exact proportion. Care is taken to make the two copper rollers L L′ exactly the same in circumference, and, being driven at a certain determined speed, they serve to deliver the yarn from the size-box, and pass it onto the drying-cylinders C C′ or air-chamber D.

The draw-rollers *n n′* in front are adjusted, by folds of calico, to the exact size necessary to take or draw what the copper rollers deliver. These draw-rollers derive their power of drawing the yarn delivered by the copper rollers L L′ from having iron rollers *m′ m′* placed on the top of them, the yarn being passed partly round both top and bottom rollers, but in such a way as to cause it to be pinched between them. The top iron roller *m m′* is made heavy, in order to give it a better hold of the yarn. So good a hold of the yarn have these two pairs of rollers that if the machine be started without the weaver's or winding-on beams W W′ being attached, and therefore without any pull on the yarn from the front, they will pull the yarn through the machine, and deliver it onto the floor. Thus it is plain that by this arrangement the two pairs of draw-rollers *m n m′ n′* pull through the machine the same length of yarn which the copper rollers L L′ give out, and the two sheets of yarn retain the same speed and the same tension without any effort or attention of the man in charge of the machine. In previous efforts to make a double sizing-machine this difficulty was not satisfactorily got over. The two weavers' beams W W′ were made to pull the yarn through the machine; and, to prevent one sheet of yarn gaining on the other, these beams were driven by friction, so that if one sheet was found to be slack and the other tight, the sizer had to ease the friction of one of the rolls, or lighten the other, and so make the beam which was not winding up fast enough take up faster, or make the one which was taking up too fast take up slower. Not only did this constant want of regulation take up too much of the man's time and attention, but he could not succeed in regulating the speed and tension of the two sheets sufficiently near.

I also drive both the weaver's beams by friction; but in my case the weavers' beams have nothing to do with pulling the yarn through the machine. They cannot affect the speed or tension of the two sheets. They simply wind up what the draw-rollers *m n m′ n′* give out, and, if the beams were not there, the draw-rollers would deliver the same quantity of yarn on the floor.

To facilitate the operation of doffing, or taking full weavers' beams out, and putting empty ones in, I suspend two ropes or light rods, U, from the top of the room. These two rods are about as far apart as the width of the weavers' beam, and, when left to themselves, will gravitate to a perpendicular position, when they are about two and a half feet clear of the weaver's beams. One of these rods may terminate at one side with an open hook, made to fit loosely the beam just outside the flange or beam head. The other rod also terminates in a hook, but this hook is preferably made to open and shut by a hinge, T, about midway of it.

When a full beam is to be taken out—say, the top beam—the open hook is put under, and partly encircles one end of the beam.

The other hook is opened and passed under the other end of the weaver's beam, and then it is closed round the beam end by means of the hinged part, till it completely encircles it when a clip, V, slips over and locks it there. The beam is then released from its bearings at each side, and left to itself. Owing to the point of suspension of the rods being away from the machine, the beam when released gently gravitates away from the machine, and leaves room for the sizer to put in another empty beam. Having done so, he, when at leisure, releases the clips—the beam is on the truck already in position to receive it.

Still further to expedite the operation of doffing, I actuate the two expanding and contracting wraiths Y Y′, or combs, from the front of the machine. This I do by applying

a pair of small bevels, *b b b' b'*, to each end of the wraith or comb, and bringing a short shaft, S S', to the front of the machine in a convenient position for the sizer. This simple device is of value for an ordinary machine, but for a double machine it is indispensable.

In adjusting the width of his yarn to every empty beam that is put on, and adjustment which has to be done accurately, and in a short space of time, by expanding or contracting the comb, a sizer is always very hurried to prevent bad work even on a single machine.

In the case of a double machine, there being two beams to adjust instead of one, it would be almost impossible for him to prevent bad work if he had to go round to the side of his machine, first to one side and then to the other, to get his comb to expand or contract. By enabling him to actuate this comb from his proper position in front of the machine, he will adjust both beams in less time than he can adjust one on the old plan, and he can do it with much greater accuracy, inasmuch as he has his beam and comb in full view of him at the same time, whereas, when, as in the plan heretofore prevailing, he went round from the front to the side of his machine to touch his comb, he lost sight of his weaver's beam, and had to guess how far to expand or contract.

The two top rollers *m m'*, already mentioned as working on the two draw-rollers *n n'*, and serving the purpose of pulling the yarn through the machine, serve also another purpose. They are made to answer as measuring-rollers, thereby doing away with special rollers for this purpose, and, being so near the weaver's beam, the sizer can work his marking apparatus without quitting the front of his machine, as he had to do formerly.

This marking is a necessary part of the doffing process, and any time saved here is useful in a single machine, and indispensable to the success of a double machine.

The saving in the marking, and the saving in the mode of working the combs Y Y' from the front, and the facility of doffing by using the strings U described, enable the sizer to attend to this, the front part of the machine, with as much ease as he can attend to an ordinary single machine.

A further saving of time, attention, and labor, but one of more importance, even, than those just described, is effected by the peculiar construction of the size-box A A', and the mode of conducting steam and size to it. The box is divided into two parts, A A', each part having its own arrangement or rollers for its own separate sheet of yarn, as has already been mentioned.

It would be very complicated if there were two sets of feed-pipes and taps to convey the size to the two divisions of the size-box; and it would be more complicated still if two floats (one for each division) were required to regulate the level of the size. All this complication is obviated by placing a cavity, Z, between the two divisions A A' of the size-boz. The size is admitted into this cavity Z, and thence it flows, by a connecting-passage, P, at one side of the machine, right and left, into the two divisions A A' of the size-box. In this cavity is a float, *h*, communicating with the feed-tap I, closing it when the size is deep enough, and opening it for a greater supply when not deep enough. Thus one feed-pipe and one float are sufficient to admit the size to both divisions, and to regulate its depth in both divisions.

Another improvement was required, to overcome an evil which would have gone far to destroy the practicability of a double sizing-machine. Already, in the case of an ordinary sizing-machine, the constant attention and watchfulness which are required to keep a steady and regular boil in the size-box are a severe tax on the man in charge of the machine. When he doffs a beam his steam is turned off, because his machine is stopped, and when he starts his machine again his steam-tap has to be readjusted, and so on, throughout the day, first finding the right point at which to admit steam in proper quantity—then disturbing that when it comes to doffing-time, and so on.

With a steam-feed pipe to each division of the size-box the inconvenience would have been doubled, and would have been really intolerable. To obviate this I pass the steam, on its way to the double size-box, through a reducing-valve, *v'*. When the taps are once adjusted in the morning to give a proper degree of steam they are never afterward touched, and require no attention during the day. When it is time to "doff," the sizer simply removes the weight X from the reducing-valve, and the steam is almost entirely shut off, or the shipper-rod *v''* lifts the weight in the act of stopping the machine. When the machine is started again the reducing-valve weight is again brought on, the taps have not been altered, and the exact amount of steam passes through, as before, and the sizer never troubles himself about his size boiling from morning till night.

Having thus described my invention, what I claim is—

1. The combination, with the two independent sizing mechanisms, of a drying mechanism and two independent sets of drawing-rolls, arranged in relation to each other substantially as described, whereby the yarns for two weaver's beams are conducted in separate sheets, and in the same direction, and kept separate until they have left the size-box.

2. The combination, with the two independent sets of sizing-rolls, of a double size-box

provided with a cavity or chamber located between them, for receiving the supply of size and distributing it to both boxes, substantially as shown and described.

3. The combination, with the double sizing and drying mechanism, of two pairs of rollers of a double head-stock, arranged substantially as described, whereby the yarn is drawn through the sizing mechanism, and delivered to the weaver's beam, substantially as and for the purpose described.

4. In combination with an adjustable wraith or comb, the short shafts S, gearing therewith, and extending to the front of the machine, whereby the wraith may be adjusted from the front, as and for the purposes set forth.

5. The combination, with the drying-cylinder C, and with the guide rods or rolls 2 2 2′ 2′, for the two sets of yarns, a fan, 1, arranged with relation thereto, as set forth, whereby a single fan may blow both sets of yarns.

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Witnesses:
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