(No Model.) 8 Sheets—Sheet 1.

J. McNAUGHT & W. McNAUGHT, Jr.

MACHINERY FOR SCOURING AND WASHING WOOL.

No. 385,761. Patented July 10, 1888.

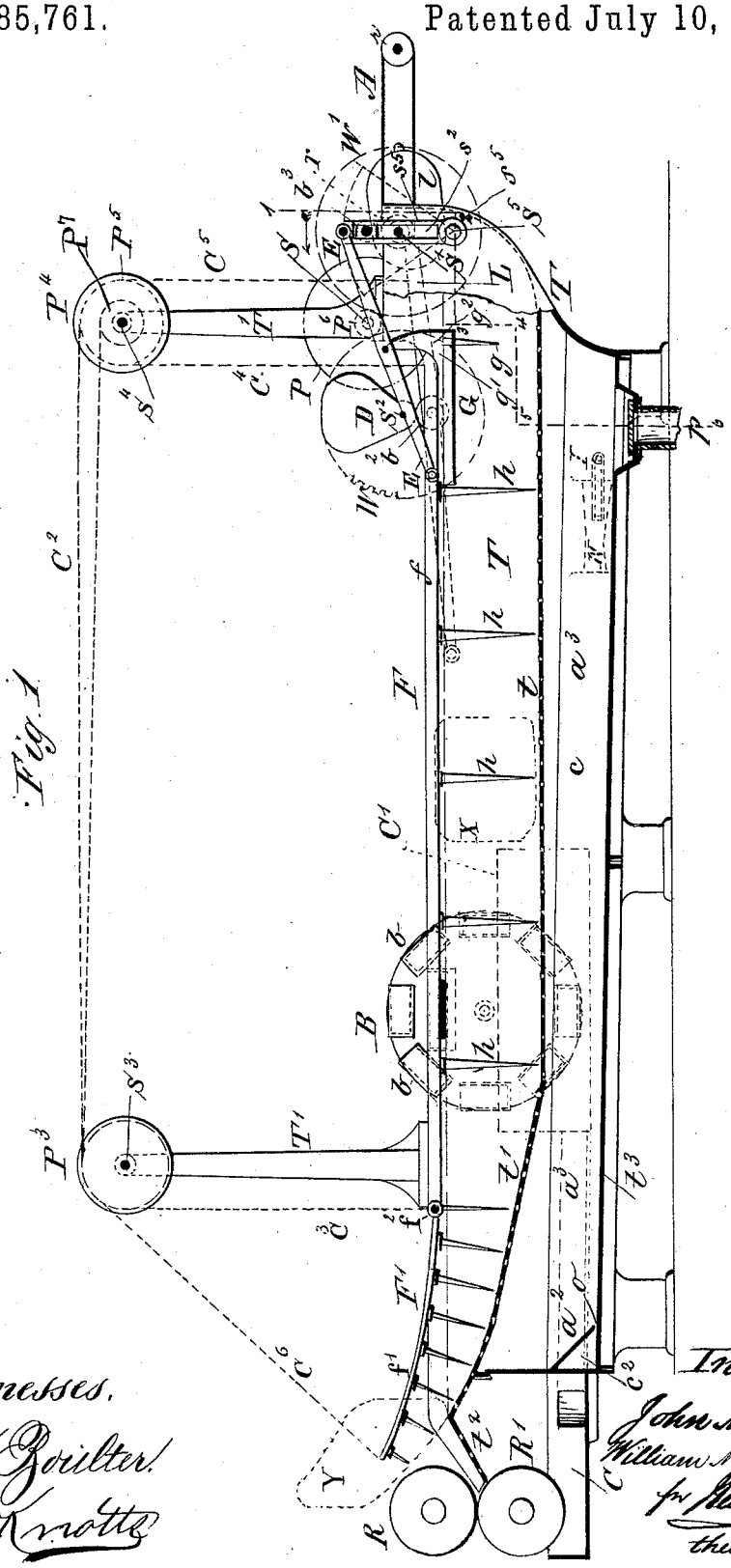

Fig. 1.

Witnesses.
W. E. Boulter.
G. W. Knotts

Inventors.
John McNaught
William McNaught jr.
per Henry Orth
their att'y.

N. PETERS. Photo-Lithographer, Washington, D. C.

(No Model.) 8 Sheets—Sheet 2.

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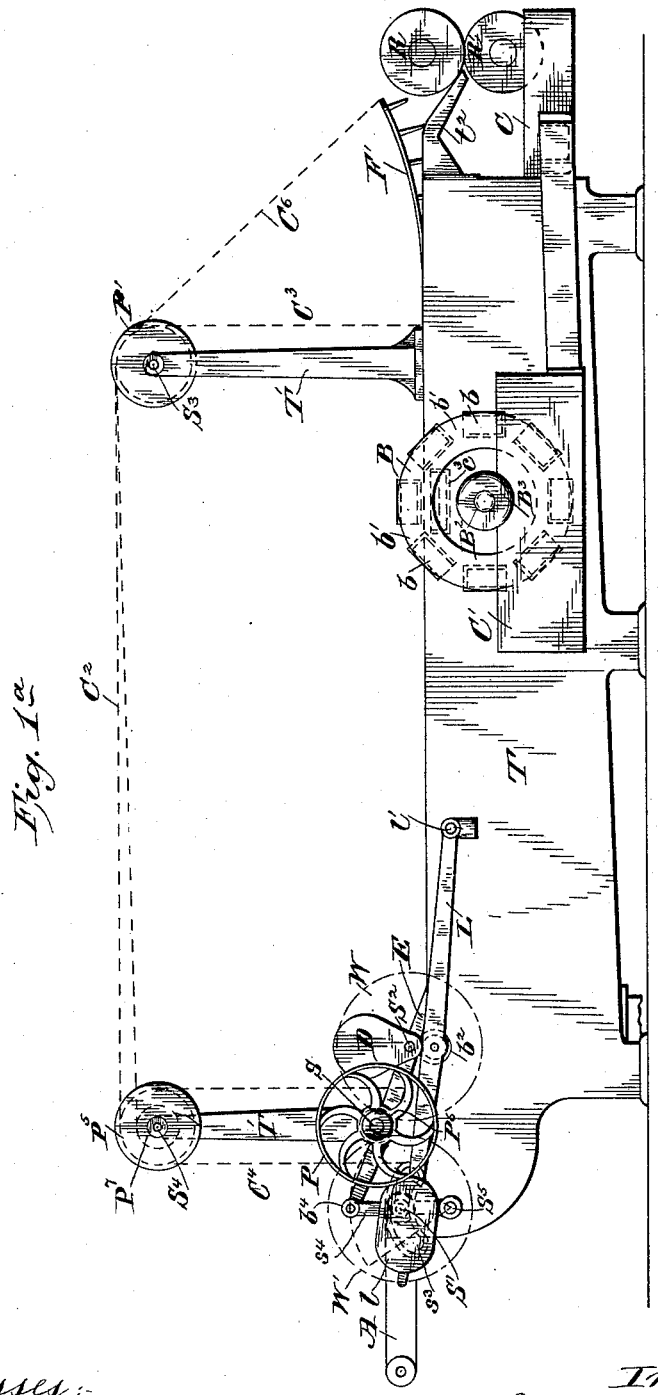

Fig. 1a

Witnesses:-
W. E. Coulter.
C. M. Gallaher.

Inventors:-
John McNaught,
William McNaught Jr.
per Munn & Co
their atty

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 8 Sheets—Sheet 3.

J. McNAUGHT & W. McNAUGHT, Jr.

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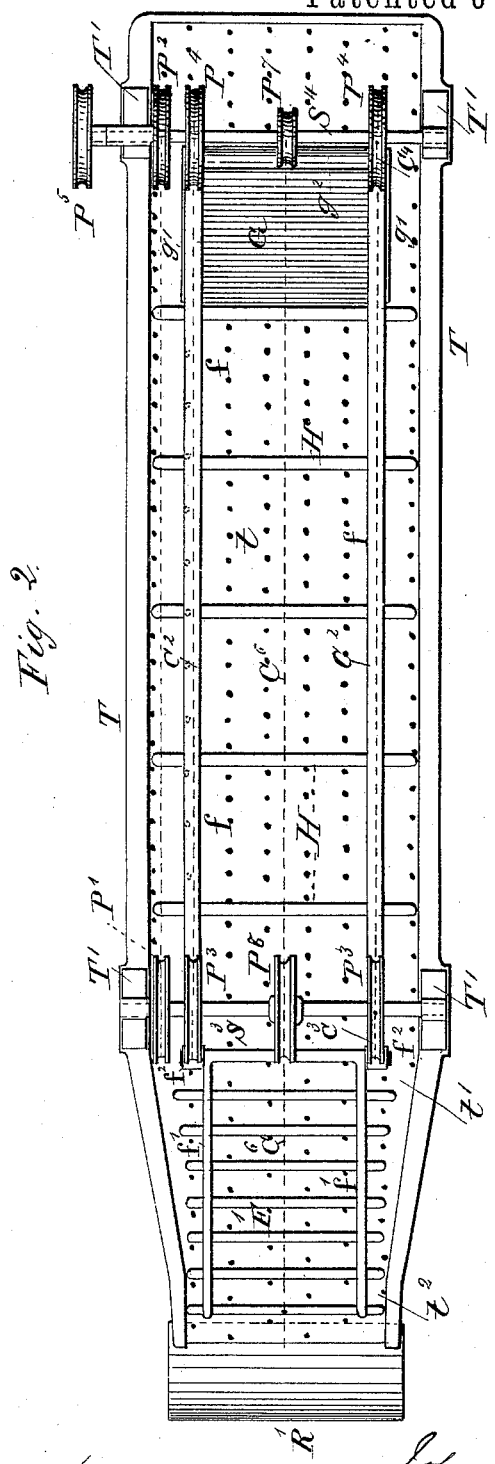

Fig. 2.

Witnesses
N. E. Boulter.
G. W. Knotts.

Inventors.
John McNaught.
William McNaught jr
per Henry Orth attorney

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 8 Sheets—Sheet 4.

J. McNAUGHT & W. McNAUGHT, Jr.

MACHINERY FOR SCOURING AND WASHING WOOL.

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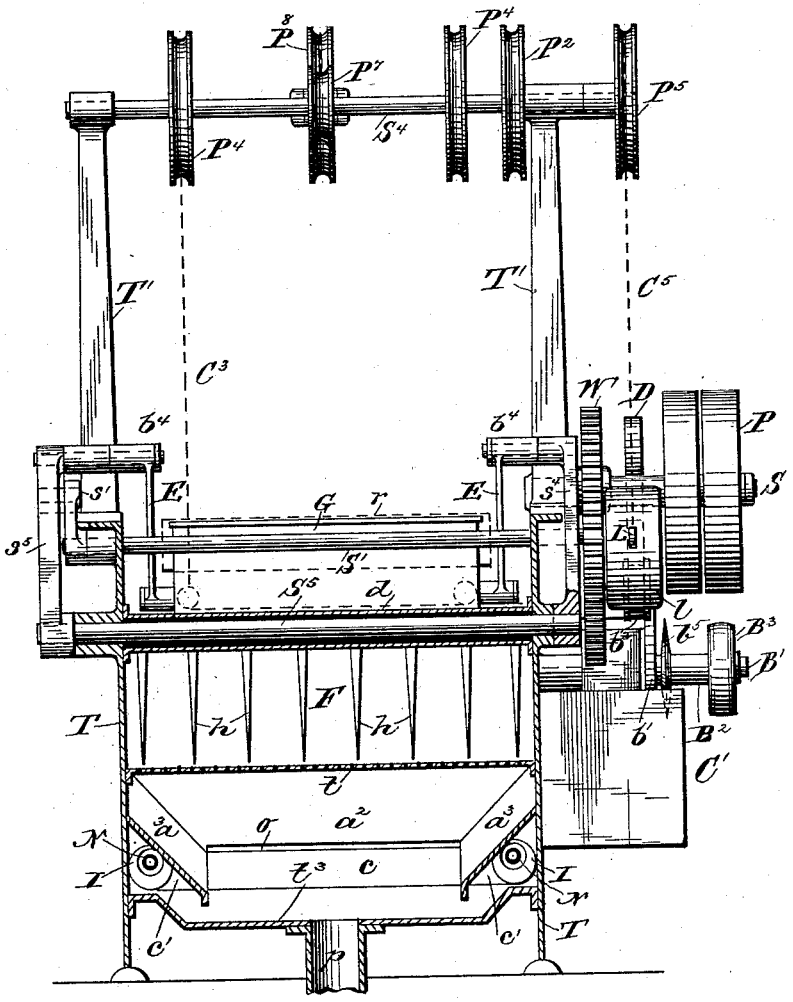
Fig. 3



Witnesses:
W. E. Coulter,
C. M. Gallaher.

Inventors:
John McNaught,
William McNaught Jr.
per Munn & Co
their attys

N. PETERS. Photo-Lithographer, Washington, D. C.

(No Model.) 8 Sheets—Sheet 5.

J. McNAUGHT & W. McNAUGHT, Jr.

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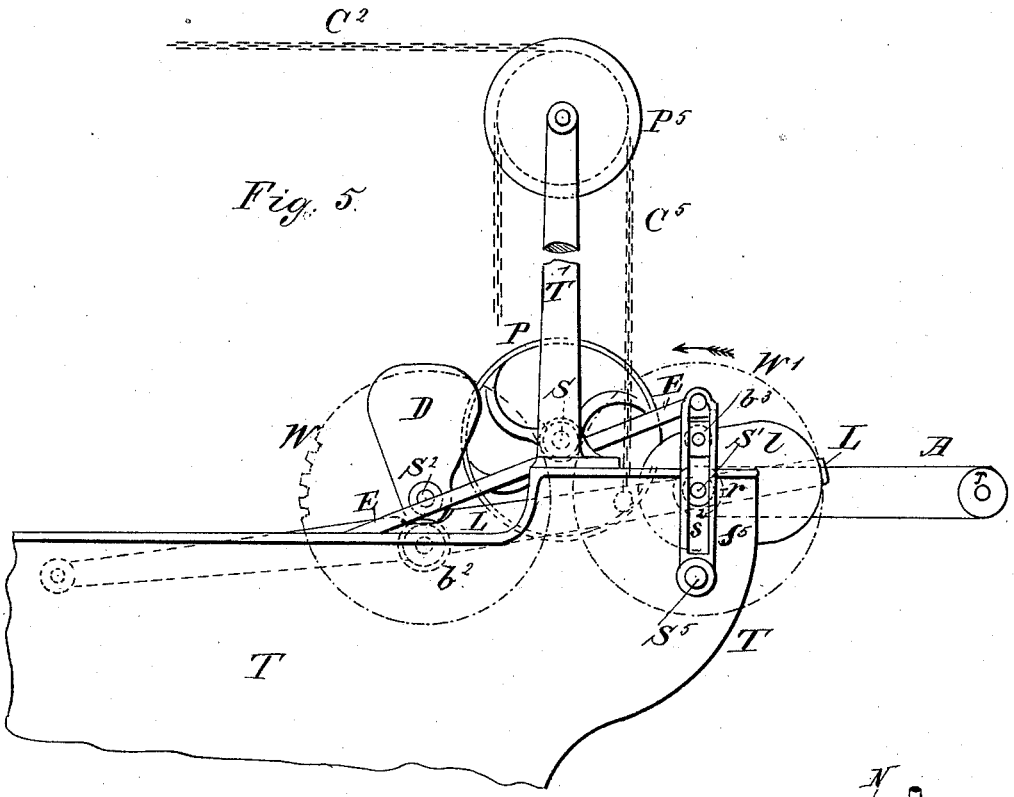
Fig. 5.



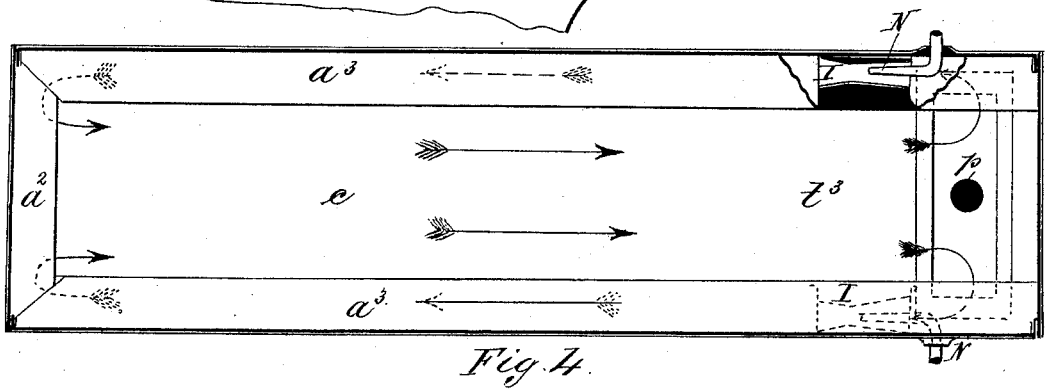


Fig. 4.

Witnesses.
H. E. Poulter.
J. V. Knotts

Inventors,
John McNaught.
William McNaught jr
by Henry Orth
their attys

N. PETERS. Photo-Lithographer. Washington. D. C.

(No Model.) 8 Sheets—Sheet 6.

J. McNAUGHT & W. McNAUGHT, Jr.

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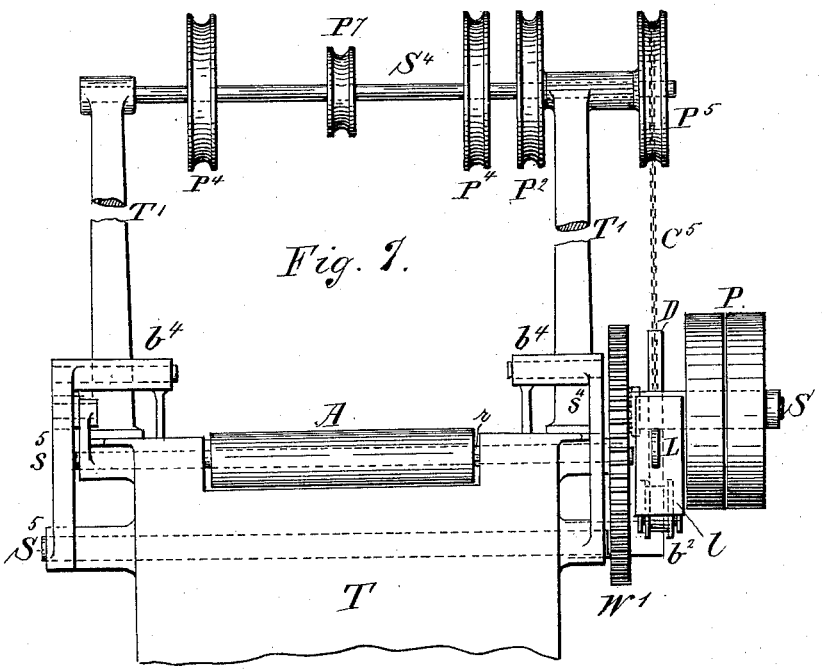

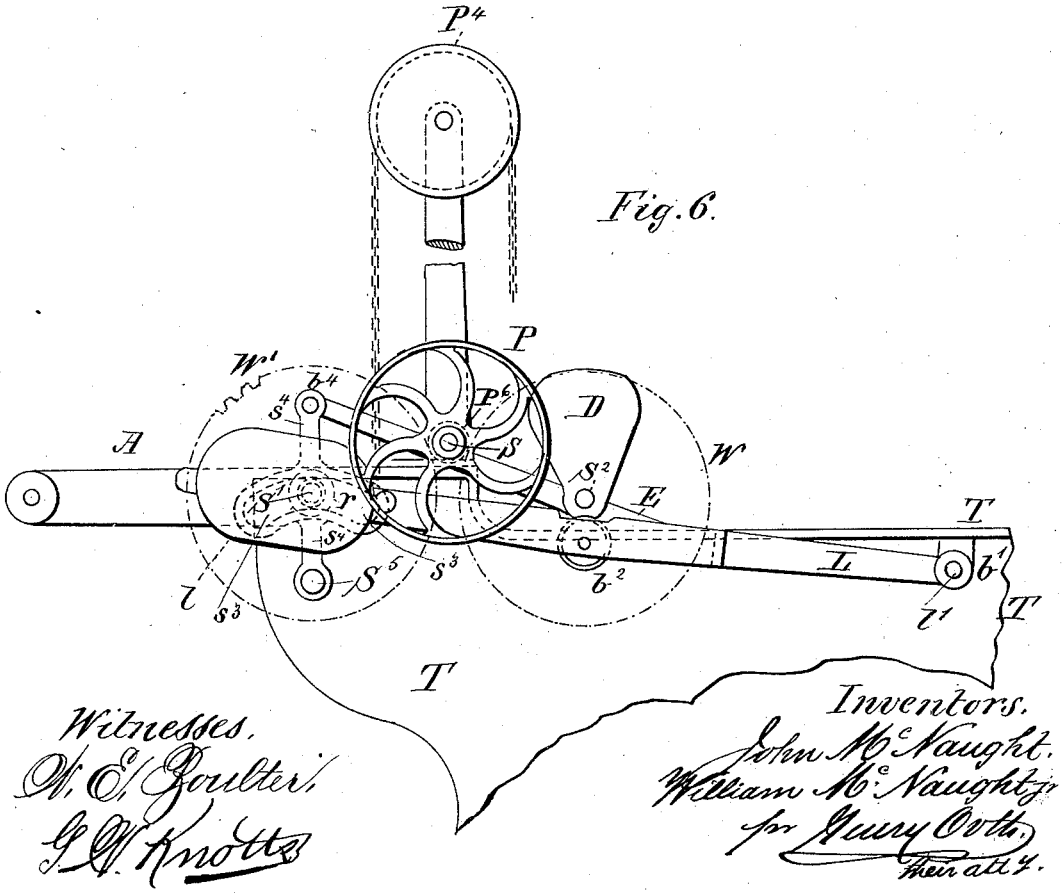

Witnesses.
W. E. Boulter.
G. W. Knotts.

Inventors.
John McNaught.
William McNaught, Jr.
per Henry Orth.
their att'y.

N. PETERS, Photo-Lithographer, Washington, D. C.

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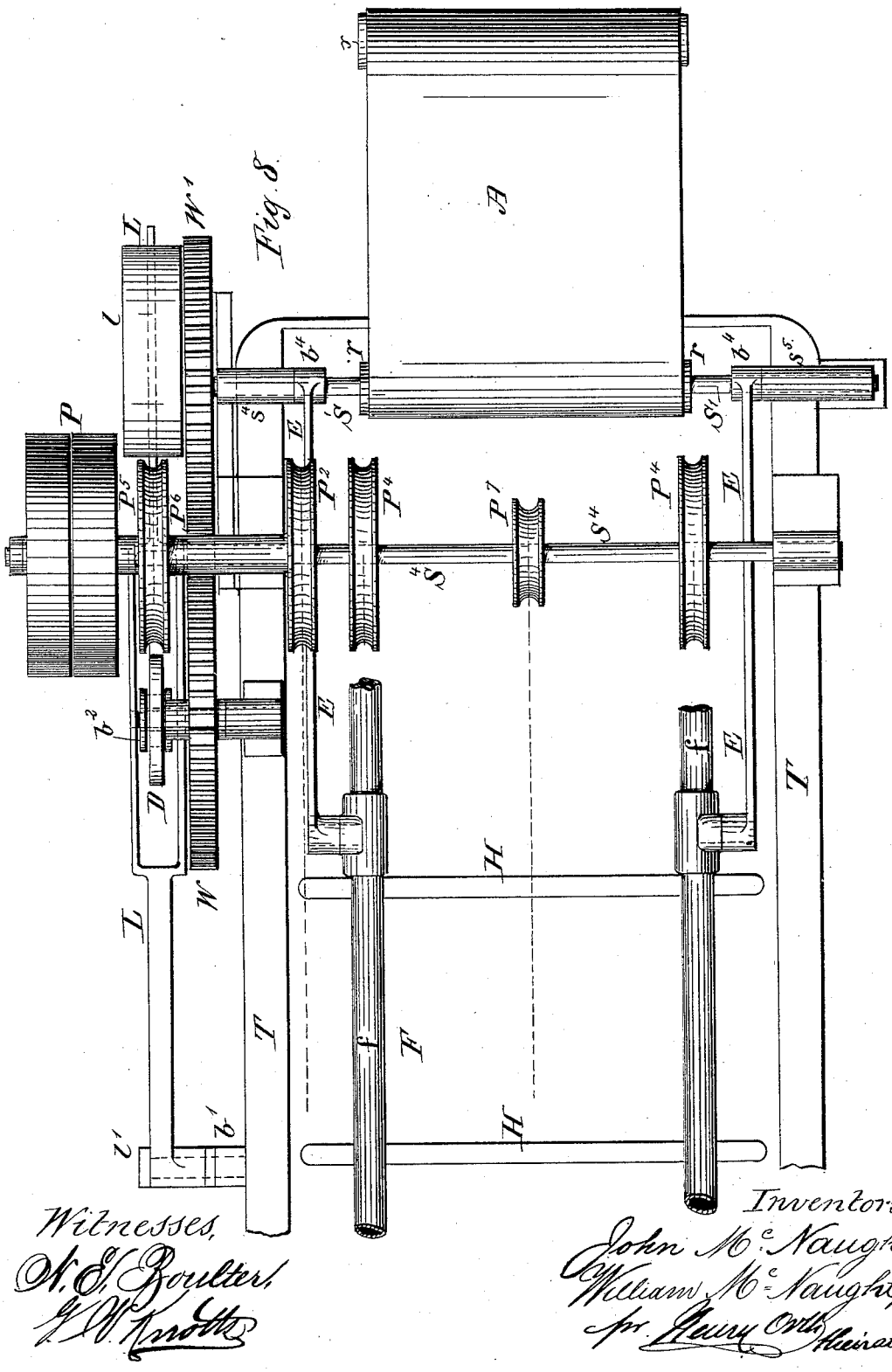

Witnesses,
N. E. Boulter
J. W. Knotts

Inventors
John McNaught
William McNaught Jr.
per Laury & Thurston Attys.

N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 8 Sheets—Sheet 8.

J. McNAUGHT & W. McNAUGHT, Jr.

MACHINERY FOR SCOURING AND WASHING WOOL.

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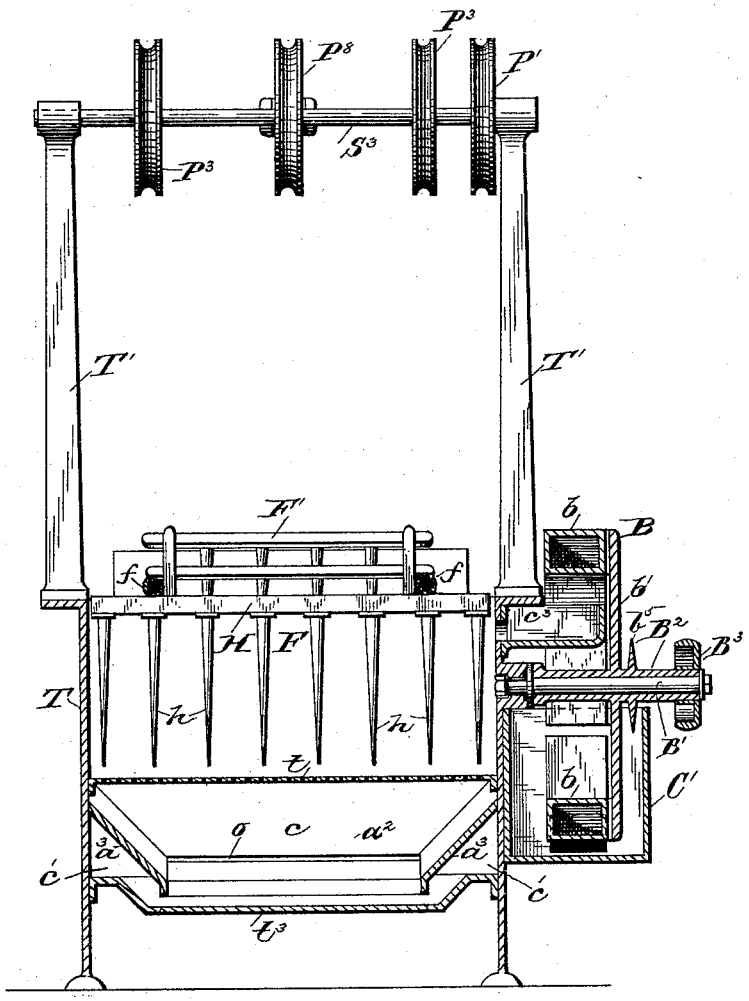
Fig. 9.



Witnesses:
W. E. Boulter
L. M. Gallaher

Inventors:
John McNaught
William McNaught Jr
per Henry Mc
their attys

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

JOHN McNAUGHT AND WILLIAM McNAUGHT, JR., OF ROCHDALE, COUNTY OF LANCASTER, ENGLAND.

MACHINERY FOR SCOURING AND WASHING WOOL.

SPECIFICATION forming part of Letters Patent No. 385,761, dated July 10, 1888.

Application filed July 27, 1883. Serial No. 102,105. (No model.) Patented in England October 3, 1881, No. 4,272, and March 1, 1882, No. 983; in France August 8, 1882, No. 150,529, and in Belgium August 9, 1882, No. 58,720.

To all whom it may concern:

Be it known that we, JOHN McNAUGHT and WILLIAM McNAUGHT, Jr., citizens of Great Britain, residing at Rochdale, in the county of Lancaster and Kingdom of Great Britain, have invented certain new and useful Improvements in Machinery for Scouring and Washing Wool and other Fibrous Materials, (for which we have obtained Letters Patent in Great Britain dated March 1, 1882, No. 983, and in part in Great Britain by Letters Patent dated October 3, 1881, No. 4,272; in part by Letters Patent in France dated August 8, 1882, No. 150,529, and in part in Belgium by Letters Patent dated August 9, 1882, No. 58,720;) and we 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, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

This invention relates to machines for scouring and washing wool and other fibrous materials, and has for its object, first, to obtain a practically uniform delivery of the wool or other material to the squeezing-rolls and to improve the operation of scouring or washing of such material by moving the same slowly and with but little agitation through the liquid by the use of single-acting harrows having a differential reciprocating movement imparted to them, so as to move slowly from the feed toward the delivery end of the trough and rapidly in a reverse direction; second, to simplify the operating mechanism of this class of machines in so constructing the operating harrow or harrows as to extend over nearly the entirely length of the washing trough and to perform the functions of the usual immersing wheel or drum, as well as that of the usual propelling and delivery harrows; third, to provide improved means whereby the liquid squeezed from the material may be returned to the washing-trough, and, fourth, to provide a more ready and efficient means for stirring, agitating, and removing the sediment in and from the washing-trough; and to these ends the invention consists in certain combinations of parts and details of constructions, substantially as hereinafter fully described, and particularly pointed out in the claims.

In the accompanying drawings, Figure 1 is a vertical longitudinal central section; Fig. 1ª, an opposite side elevation; Fig. 2, a plan view, the harrow-operating mechanism being removed; and Fig. 3 is a vertical transverse section on the line 1 2 3 4 5 6 of Fig. 1 of a wool-washing machine embodying some of our improvements. Fig. 4 is a horizontal longitudinal section taken through the sediment-chamber, a portion of one of the lateral passages being broken away to show the arrangement of the injector. Figs. 5 and 6 are partial side elevations taken from opposite sides of the machine at the rear end; Fig. 7, a partial rear end elevation; Fig. 8, a partial plan view illustrating, on an enlarged scale, the operating mechanism for the harrows; and Fig. 9 is a vertical transverse section of the machine, taken through the axis of the elevating-wheel and looking toward the delivery end of the machine.

Like letters indicate like parts wherever such may occur in the above figures of the drawings.

T indicates the washing-trough; *t*, its perforated false bottom; *t'*, the incline at the delivery end of said trough, and t^2 the reverse or delivery incline or chute.

A is the feed-apron at the feed end of the machine, and R and R' the squeezing-rolls at the discharge end of said machine in front of the chute or reverse incline t^2. The squeezing-roll R' is, as shown, located below the level of the liquid in the trough and partly within a collecting-chamber, C, formed underneath the discharge end of the machine for collecting the liquid drained from and squeezed out of the material treated, and from which chamber the liquid is conducted to a receiving-chamber, C', and elevated by any convenient means back into the washing-trough T, preferably by means of the elevating mechanism shown in Figs. 1, 1ª, 3, and 9, and which is constructed as follows: Upon a shaft, B', that has its bearings in the side of the trough T, is mounted a hollow or tubular shaft, B^2, to which is attached or upon which is formed a bucket-

wheel, B, formed by a disk, b', or a series of radial arms having each buckets b attached thereto or formed thereon, said buckets being open at one end, as shown. To the side of the trough T, above the bucket-wheel shaft B′, is attached a delivery hopper or chute, c^3, that opens into said trough and delivers thereto the liquid elevated by the buckets b.

To prevent any liquid from passing over the outer wall of the chamber C′ along shaft B^2, we form a disk, b^5, upon said shaft, that serves as a shield, and from which the liquid runs back into chamber C′. Upon the outer end of the shaft is mounted or formed a driving-pulley, B^3, belted to and driven from any convenient rotating part of the machine.

The feed-apron A may be carried by suitable rollers mounted each on a separate shaft, and said rollers may be driven in any suitable manner from some of the moving parts of the machine, or the forward roller, r, may be mounted on one of the shafts of the operating mechanism for the harrows, as hereinafter described.

In order to facilitate the cleansing of the sediment-chamber c below the false bottom t of the trough, we establish a circulation in the direction of the arrows, Fig. 4, by means of a jet or jets of steam, whereby we are enabled to obtain a rapid circulation and agitation of the liquor and consequent removal of the sediment collected in chamber c.

The chamber c is provided with the usual discharge-pipe, p, normally closed by any suitable valve or equivalent means. Between the false bottom t and the bottom of the trough there are angle-pieces a^3 on each side, extending from end to end of the chamber c, said angle-pieces forming spaces or chambers c', that communicate with a space or chamber, c^2, formed by an angle-piece, a^2, extending across the chamber c at the forward end thereof. The lower edge of the angle-piece a^2 does not quite touch the bottom t^3 of the trough, thus leaving a narrow slit or opening, o, between the two, as shown in Figs. 1, 3, and 9. Within each chamber c' is located an injector cone or pipe, I, provided with an injector-nozzle, N, as shown in full lines and dotted lines in Figs. 1, 3, and 4, one of the angle-pieces a^3 in Fig. 4 being partly broken away to show the injector cone and nozzle. When steam is admitted and injected from the injectors I I, a circulation is established in the direction of the arrows along the chambers $c\ c'\ c^2$, thence through opening o, along the bottom t^3, back to and through said chambers, or to and through the discharge-pipe p when the valve thereof is opened. The circulating current established in the liquid by the injected steam stirs up the sediment, mixes it, and is carried out with said liquid.

In wool-washing machines of usual construction the wool, before being carried over the delivery-chute to the squeeze-rolls, is usually dragged up an incline or grid or otherwise elevated above the level of the liquid in the trough to drain the same of the greater portion of the liquid held thereby. It is well known that a large amount of dirt is usually combined with the wool, especially during the first operation of washing, and this dirt remains in the wool after the liquid has been drained off. When the wool reaches the squeeze-rolls, this dirt is more intimately combined with the wool by the action of the rolls and renders its removal in subsequent operations of washing more difficult. On the other hand, the squeeze-rolls are more or less coated with dirt, which is taken up by the successive batches of wool carried thereto. This we avoid by maintaining the level of the liquid in the trough even with the upper edge of the delivery end of said trough and by sweeping the wool without draining it directly over said delivery end to the squeeze-rolls. It will be readily seen that as each batch of wool is swept over the delivery end a comparatively large volume of liquor is also swept over with it, and a large portion of this liquor rushes in advance of the wool onto the squeeze-rolls, thereby cleansing the same of any dirt adhering thereto before the wool reaches it. The wool on reaching the rolls is also soaked or saturated with as much liquor as it will hold, and on passing through the squeeze-rolls this excess of liquor will carry the dirt along with it, so that the operation of washing is materially expedited and a cleaner article obtained.

We are aware that it has heretofore been proposed to sweep the wool directly from the bath to the squeeze-rolls without dragging it up an incline, and it has also been proposed to drain the wool and then supply it with fresh liquor before passing it to the squeeze-rolls. In the former case the squeeze-rolls were so arranged as to have their nip above the level of the liquid. The wool is therefore partially drained before reaching the squeeze-rolls, as it is lifted out of the liquor, and in the latter case but a comparatively small body of water or liquor is taken up by the wool before it reaches the squeeze-rolls; but by locating the squeeze-rolls so that their nip will lie in a plane below the level of the liquor in the trough the above results are obtained.

The operation of washing may be greatly accelerated and the operating mechanism considerably simplified by extending the harrow nearly the full length of the washing-trough and giving said harrow a differential movement—that is to say, a slow forward movement when the harrow is propelling the material and a rapid backward movement when the harrow is not acting on said material.

In conjunction with a toothed frame or harrow actuated as described the usual immersing-wheel may be employed. We prefer, however, to so construct the propelling and delivery harrow as to perform also the function of an immersing-wheel, and such wheel may therefore be dispensed with, as well as the mechanism to operate it. For this purpose the harrow at the feed end of the trough is

provided with means for immersing the wool as it is fed to said trough.

We will now describe the toothed frame or harrow constructed to perform the functions of an immersing, propelling, and delivery harrow, which construction we prefer, although we do not desire to limit ourselves to its exclusive use, referring more particularly to Figs. 1, 1ª, 2, 3, 5, 6, 7, 8, and 9.

The frame of the harrow F is composed of two longitudinal girts, *f*, preferably tubular, as more plainly shown in Figs. 8 and 9, to make the frame as light as possible, and said girts are connected together by a series of cross-girts, H, that constitute the toothed heads, each of said heads being provided with a number of teeth, *h*.

To the forward end of the harrow F is jointed by a hinge or pivot joint, f^2, the delivery-harrow F′, as shown in Figs. 1 and 2, said harrow F′ being supported at its forward or free end from the washing-trough, so as to permit it to move with the harrow F.

To the rear end of harrow F is secured the immerser, which may be made of any desired construction—as, for instance, it may consist of a perforated sheet-metal plate or a woven fabric, or it may consist of a grid, G, as shown, that extends nearly across the trough.

The open-work immersing surface G is preferably provided with teeth or prongs *g*, or such teeth or prongs may form a part of the frame of the harrow, and said plate has upwardly-projecting lateral walls *g′* and end walls, g^2, the latter extending above the longitudinal girts of the frame of the harrow to prevent the material fed to the machine from floating onto the harrow when below the level of the liquid in the trough, for obvious reasons. The immerser may be rigidly attached, in any suitable manner, to the girts *f* of the frame of the harrow.

It will be readily understood that when the combined harrow and immerser moves back above the level of the liquid in the trough T and descends into the liquid at the limit of such backward movement the immerser will carry the material down with it and the teeth will propel it forward at its next forward movement. Thus a single harrow is made to act as an immersing, a propelling, and a delivery harrow.

The harrow may be operated to immerse the material, propel it along the washing-trough to the delivery end thereof, and deliver the material to the squeezing-rolls by any suitable mechanism, and, if desired, a uniform reciprocating motion in different planes may be imparted to such harrow, whereby it is caused to move in one direction through the liquid in the trough, then raised above the level of such liquid and caused to move in a reverse direction, and again lowered into the liquid at the same speed.

As stated above, to accelerate the operation of washing, and especially to obtain a uniform or nearly uniform delivery of material to the squeezing-rolls, we prefer to actuate said harrow or harrows at differential speeds, causing them to move slowly while propelling the material and rapidly when lifted out of the liquid, a convenient arrangement of mechanism for obtaining this result being shown in Figs. 1, 1ª, 2, 5, 6, 7, 8, and 9.

Upon opposite sides of the trough T are secured in pairs four standards, T′, the upper ends of which form bearings for two cross-shafts, S^3 S^4, the shaft S^3 carrying two pulleys, P^3, and the shaft S^4 two pulleys, P^4.

To the forward end of each longitudinal girt *f* is attached one end of a suspension rope or chain, C^3 C^3, and at the rear end of each of said girts is attached a like rope or chain, C^4 C^4. The other ends of ropes or chains C^3 C^3 are attached to the pulleys P^3 P^3, and the corresponding ends of ropes or chains C^4 C^4 to the pulleys P^4 P^4 on shafts S^3 S^4 near the forward or delivery and near the feed end of the machine, respectively.

To the forward or free end of the delivery-harrow F′ is attached one end of a rope or chain, C^6, that passes over pulley P^8 on shaft S^3, thence to pulley P^7 on shaft S^4, to which the other end of said rope or chain is secured, as more plainly shown in Fig. 2.

Rigid suspension devices may be employed, such as rods, links, &c. We prefer, however, to employ flexible suspension devices, for the reason that the harrow can be lifted out of the washing-trough and ready access had thereto, and when such harrow is lifted out of the trough the latter will be clear of all obstructive mechanism—a great advantage in this class of machines.

The pulleys P^3 P^4 are or may be directly or indirectly connected by flexible or rigid connections, in the latter case through their shafts by means of cranks or eccentrics and connecting-rods upon the outer ends of said shafts and in the former case by means of a rope or chain, C^2, passing around driving-pulleys P′ P^2, mounted, respectively, on shafts S^3 S^4. The latter shaft carries upon its outer end a pulley, P^5, to which one end of a rope or chain is attached, the other end of which is connected to a lever, L, having its fulcrum *l′* on a bracket secured to the side of the trough. The lever L carries a weight, *l*, that in part counterbalances the weight of the harrow F, and is provided with a slot in which is mounted a roller, b^2, upon which operates a cam, D. This cam D is mounted upon a stud or short shaft, S^2, said shaft carrying a toothed wheel, W, that meshes with a pinion, P^6, on the stud or short shaft S, upon which the driving-pulley P is mounted. The pinion P^6 also gears with a toothed wheel, W′, on one end of a transverse shaft, S′, that has its bearings in the sides of the trough, and said shaft S′ carries a crank-arm, *s′*, upon the pin of which is mounted a block, b^3, Fig. 5, that is fitted and slides in a slot, s^2, formed in a radial arm, s^5, secured to one end of a transverse rocking shaft, S^5, that also has its bearings in the sides of the wash-

ing-trough. The shaft S′ passes through a segmental slot, s^3, formed in an arm or lever, s^4, secured to the opposite end of rock-shaft S^5, as shown in Figs. 1ª and 6.

Both the arms s^4 s^5 of shaft S^5 are provided with bosses or bearings b^4, upon which is pivoted one end of two connecting rods or links, E, pivoted at the other end in suitable bearings attached to or formed on the longitudinal girts f of the harrow F. The rotation of the shaft S′ causes the block b^3 to reciprocate in the slot s^2 of the arm s^5 of the rock-shaft S^5, whereby the latter is oscillated or rocked to and fro to impart to the harrow the alternate quick and slow reciprocating motion in the washing-trough hereinbefore referred to.

The shaft S^5 is preferably inclosed in a tubular bearing or sleeve, d, to protect it from the action of the liquid, though it may pass through suitably-packed bearings in the sides of the washing-trough, or said shaft S^5 may be placed outside the end of the trough. The shaft S′, as shown, occupies such a position on the washing-trough as to adapt it as a support, as hereinbefore alluded to, for one of the rollers r of the feed-apron A, as shown in dotted lines in Figs. 1, 3, and 5.

It will be obvious that if the crank-shaft S′ is rotated in the direction of the arrow, Figs. 1 and 5, by means of the mechanism described, a slow forward or propelling movement will be imparted to the harrows to carry the wool or other material toward the delivery end of the machine, while the backward movement of the harrows out of the liquid will be a rapid one.

The combination of the movements of the crank-shaft S′ and cam D is such as to cause the teeth of the harrow F to describe the geometrical figure shown in dotted lines at X and those of the delivery-harrow F′ the figure shown at Y, Fig. 1, the incline t' of the trough having a curvature corresponding with the lower curved line of the path of the teeth.

By depressing the weighted lever L and locking the same into position the harrow may be lifted out of the way above the washing-trough and held in that position.

We have previous to the date of our present invention invented and patented modes of actuating harrows where the up-and-down movement has been effected by cams acting upon flat surfaces which were directly connected with and partook of the to-and-fro movement as well as the up-and-down movement of the harrow, which surfaces were adapted to slide upon the cams—for instance, as shown in English Letters Patent No. 1,519, of April 14, 1880; but by such arrangement of cams acting upon sliding flat surfaces the most desirable lifting movements could not be so conveniently imparted to the harrows as they can by our present invention, where cams are and can be used of any desired shape to act upon rounded or projecting surfaces which are not directly connected with and do not partake of the to-and-fro movement of the harrows.

The harrow illustrated in the drawings is shown at the middle position of its forward stroke as when propelling and delivering. This harrow has been shown as composed of two sections jointed together; but it will be understood that a greater number of jointed sections than two or a rigid harrow extending the full length of the trough and operating as an immersing, propelling, and delivery harrow may be employed.

Having now described our invention, what we claim is—

1. In a wool-washing machine, the combination, substantially as described, with the washing trough having the upper edge of its delivery end below the like edge of its feed end and side walls, of a delivery rake or harrow moving outwardly and upwardly along said delivery end of the trough and partly beyond the upper edge thereof, and inwardly, with the point of its teeth in a plane above said upper edge, for the purpose specified.

2. In a wool-washing machine, the combination, substantially as described, with the washing-trough having the upper edge of its delivery end below the like edge of its feed end and side walls, and squeeze-rolls located outside of and below the upper edge of said delivery end, of a delivery rake or harrow moving outwardly and upwardly along said delivery end of the trough and partly beyond the upper edge thereof, and inwardly, with the point of its teeth in a plane above said upper edge, for the purpose specified.

3. In a wool-washing machine, the combination, substantially as described, with the washing-trough having the upper edge of its delivery end below the like edge of its feed end and side walls, of a delivery rake or harrow moving outwardly and upwardly along said delivery end of the trough and partly beyond the upper edge thereof, and inwardly, with the point of its teeth in a plane above said upper edge, and a propelling rake or harrow pivotally connected with and imparting motion to said delivery rake or harrow.

4. In a wool-washing machine, the combination, with the washing-trough, a toothed propelling-harrow, and an immerser rigidly connected with the propelling-harrow and partaking of the movements thereof, of a delivery-harrow pivotally connected with the propelling-harrow and operated by and receiving its forward and backward movements directly from said propelling-harrow, as described.

5. In a wool-washing machine, the combination, with the propelling-harrow, of an immersing-grid connected therewith and provided with the end wall, g^2, substantially as and for the purpose specified.

6. In a wool-washing machine, the combination, with the propelling-harrow, of an immersing toothed grid connected therewith and provided with an end wall, g^2, substantially as and for the purpose specified.

7. In a wool-washing machine, the combination, with the washing-trough and its per-

forated false bottom arranged to form a sediment-chamber below said false bottom, and passages or ducts in communication with said chamber, of injectors for injecting steam into said passages to induce a circulation of the liquid within said sediment-chamber.

8. In a wool-washing machine, the combination, with the washing-trough and a suspended harrow, of a counter-balance connected with said harrow for holding the same in suspension in the trough.

9. In a wool-washing machine, the combination, substantially as described, with the washing-trough and a harrow having its points of suspension above said trough, of a weighted lever connected with the suspensory devices of the harrow and operating to hold said harrow in suspension within or above the trough, for the purpose specified.

10. In a wool-washing machine, the combination, with the washing-trough and a harrow composed of a plurality of sections articulated together and having their points of suspension above said trough, of a weighted lever connected with the suspensory devices of the harrow and operating to hold said harrow in suspension within or above the trough.

11. The combination, with the washing-trough and the toothed frame or harrow, of mechanism for actuating the latter, consisting of the driving-shaft S, the shafts S′ S², gearing for transmitting rotation of shaft S to said shafts S′ S², the rock-shaft S⁵, carrying slotted arms s^4 s^5, a crank-arm carried by shaft S′ and provided with a bearing-block operating within the slot of arm s^5, a rod connected with the toothed frame or harrow and with the arm s^5, a lever pivoted to the trough and operated upon by a cam mounted on shaft S², and flexible connections between said lever and the harrow, said parts being constructed and arranged for co-operation as described, for the purpose specified.

12. The combination, with the washing-trough and the toothed frame or harrow, of mechanism for actuating the latter, consisting of the driving-shaft S, the shafts S′ S², gearing for transmitting rotation of shaft S to said shafts S′ S², the rock-shaft S⁵, carrying slotted arms s^4 s^5, a crank-arm carried by shaft S′ and provided with a bearing-block operating within the slot of arm s^5, a rod connected with the toothed frame or harrow and with the arm s^5, a lever pivoted to the trough and provided with a counterbalancing-weight, *l*, said lever being operated upon by a cam mounted on shaft S², and flexible connections between said lever and the harrow, said parts being constructed and arranged for co-operation as described, for the purpose specified.

In testimony whereof we affix our signatures in presence of two witnesses.

JOHN McNAUGHT.
WILLIAM McNAUGHT, JR.

Witnesses:
PETER J. LIVSEY,
JAMES WOOD.