No. 654,170. Patented July 24, 1900.

G. MALARD.

WOOL WASHING MACHINE.

(Application filed July 31, 1899.)

(No Model.) 3 Sheets—Sheet 1.

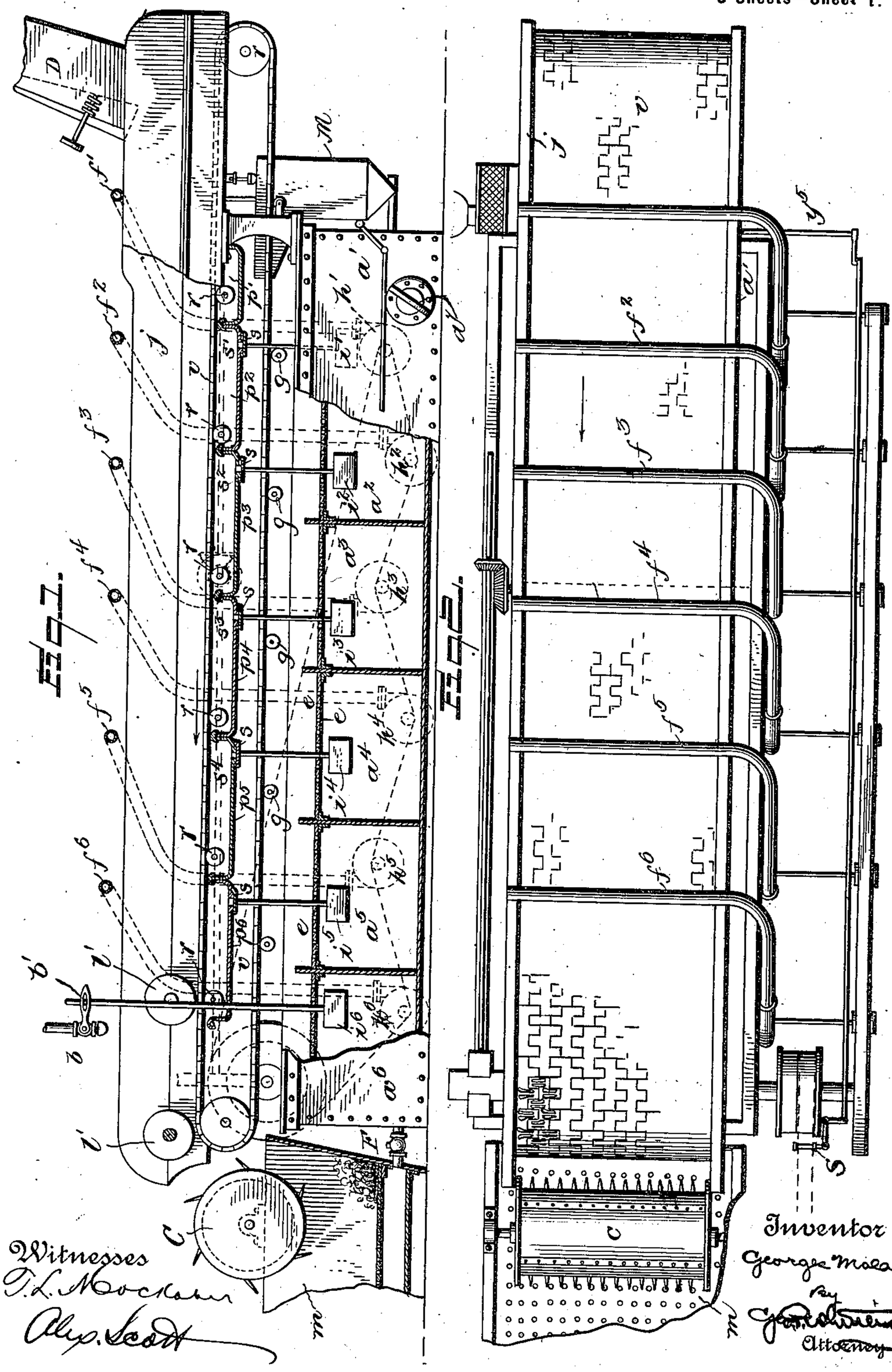

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Fig. 5.

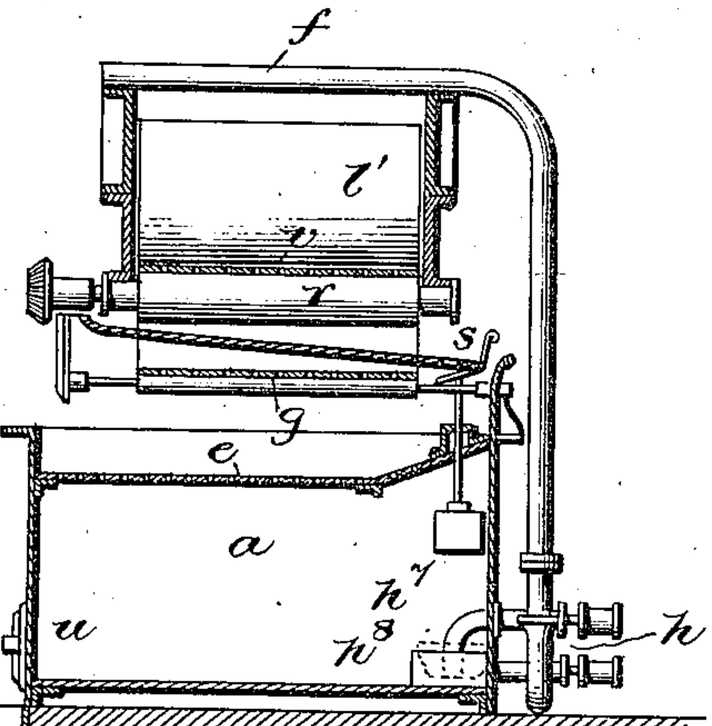

Fig. 4.

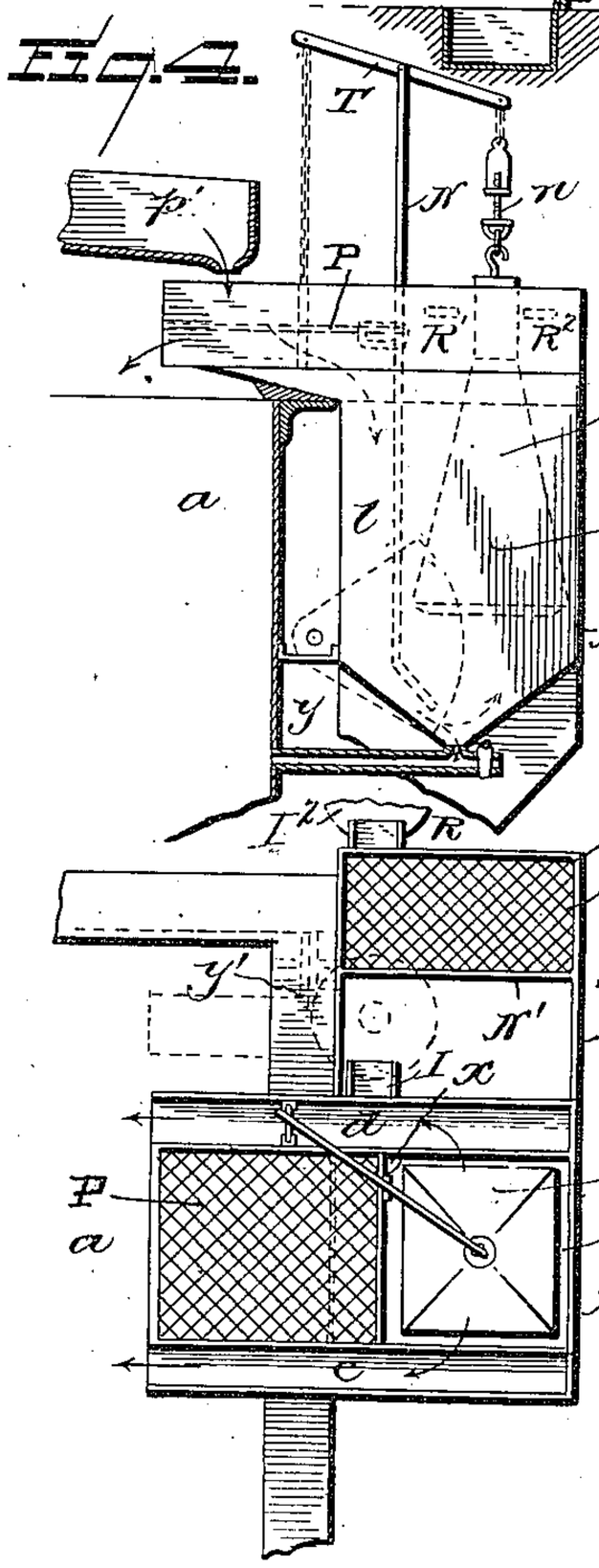

Fig. 6.

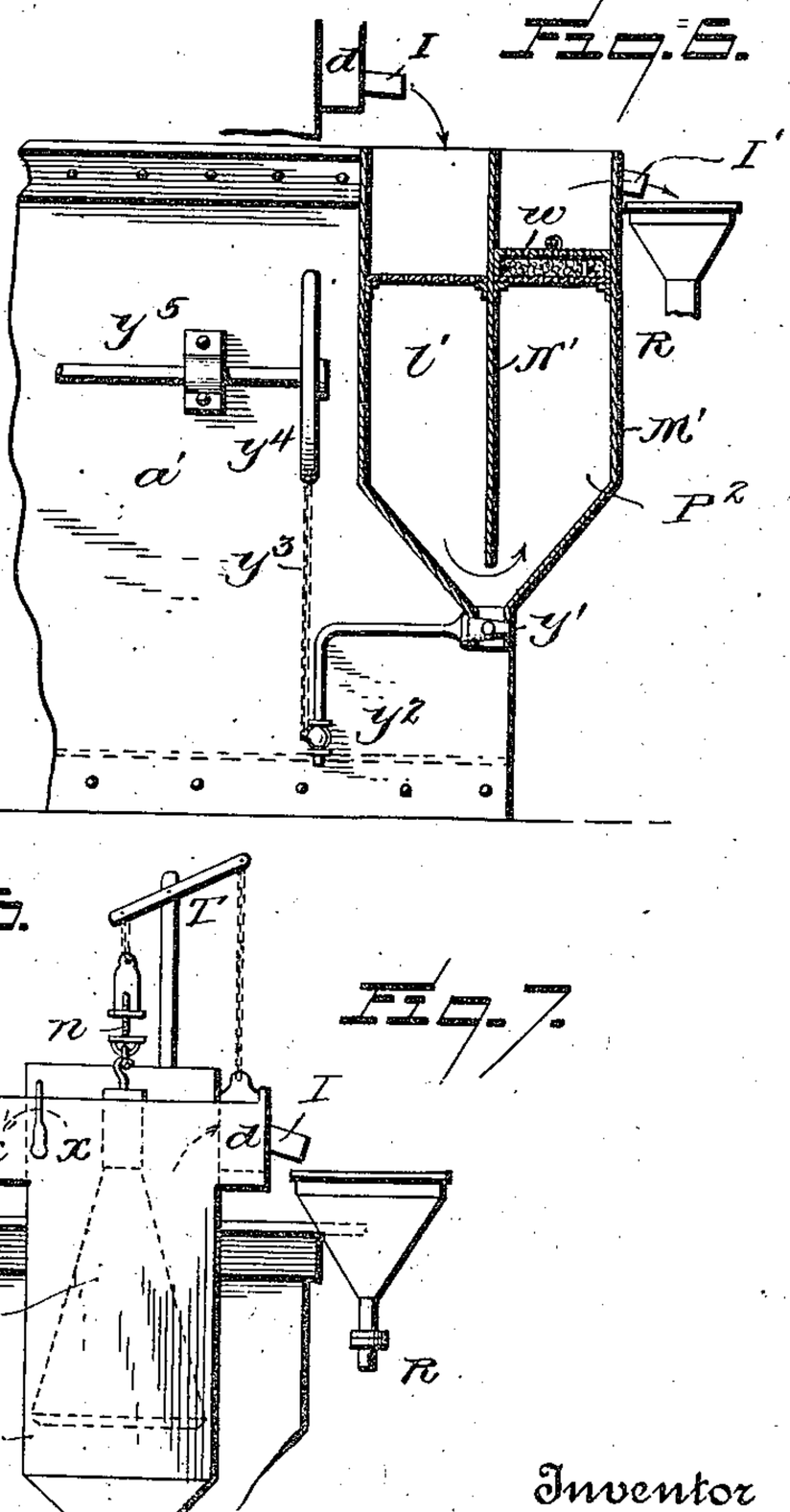

Fig. 7.

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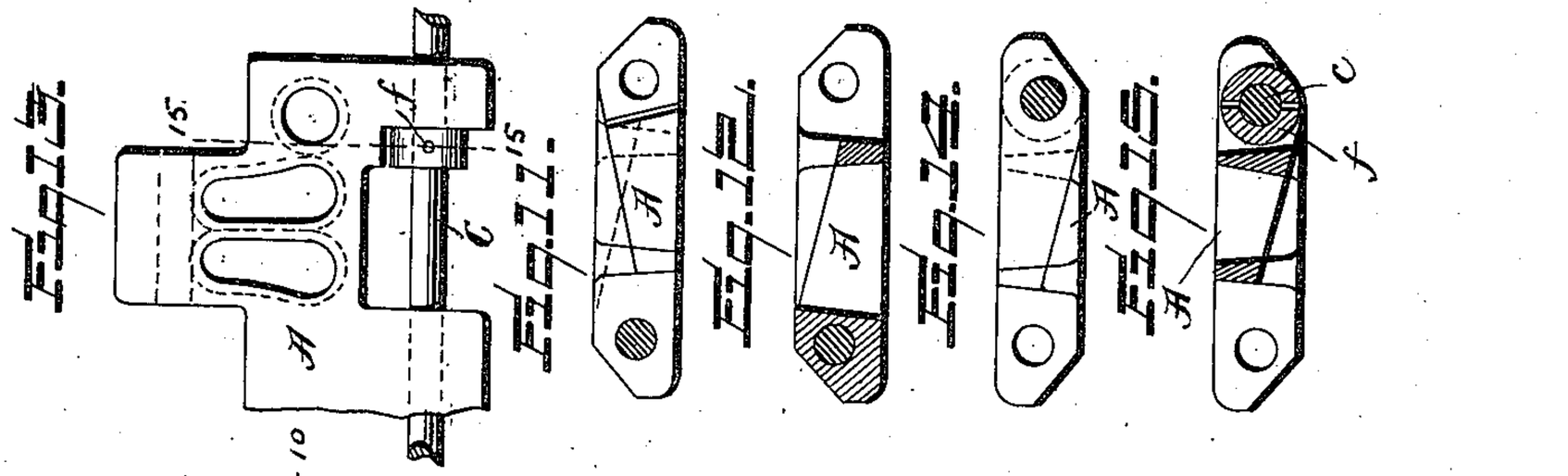

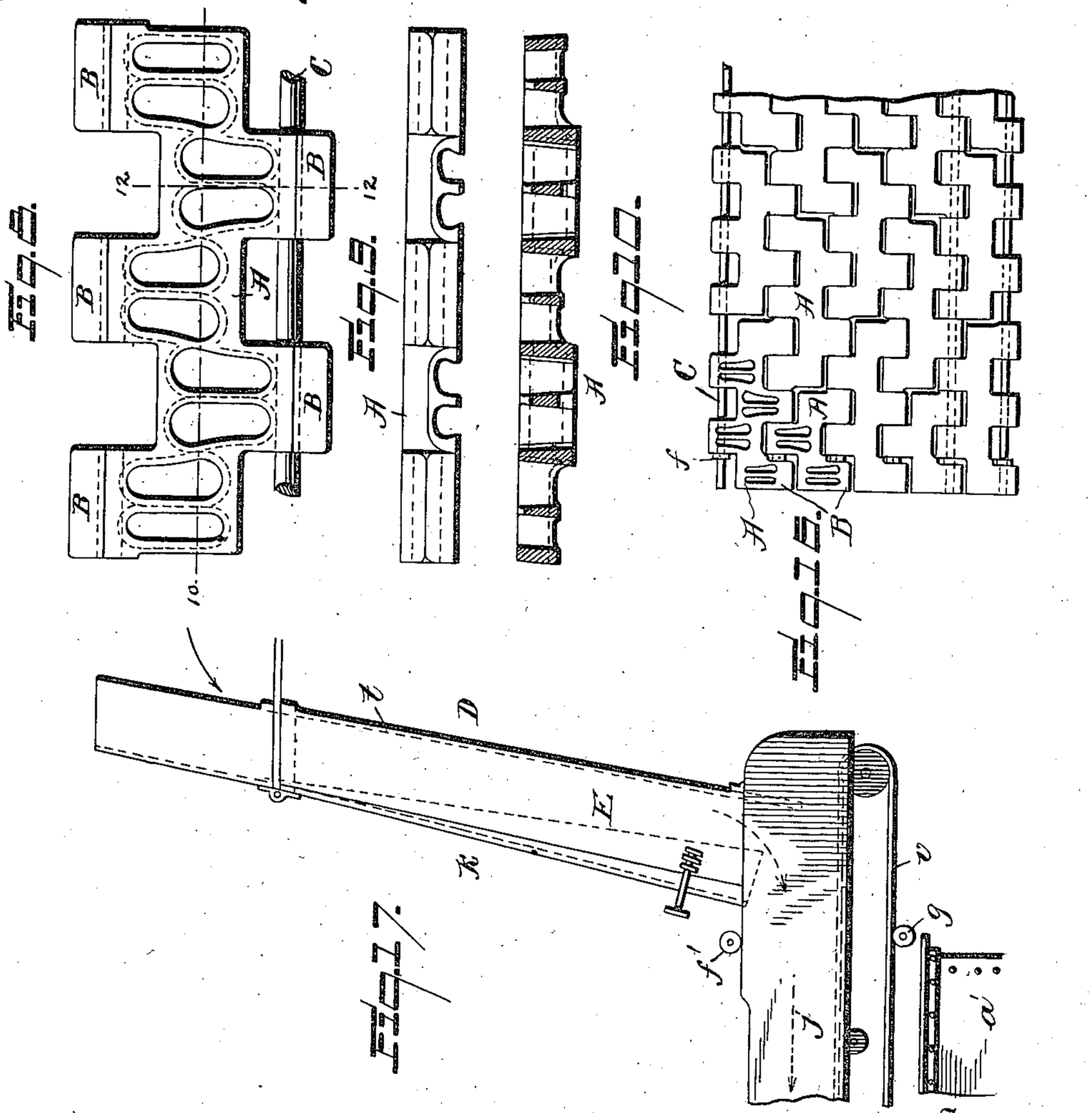

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UNITED STATES PATENT OFFICE.

GEORGES MALARD, OF TOURCOING, FRANCE.

WOOL-WASHING MACHINE.

SPECIFICATION forming part of Letters Patent No. 654,170, dated July 24, 1900.

Application filed July 31, 1899. Serial No. 725,705. (No model.)

To all whom it may concern:

Be it known that I, GEORGES MALARD, a citizen of the Republic of France, residing at Tourcoing, in the department of Nord, France, have invented certain new and useful Improvements in Wool-Washing Machines; and I do 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 the letters of reference marked thereon, which form a part of this specification.

The apparatus hereinafter described, which is employed in the preparation of all kinds of raw wools for washing, has been designed to effect in a single continuous operation all the preliminary treatments which the wools have to undergo, with a view to economize, regularize, hasten, and improve their washing. Thus one may have in the same machine a feeder, a steeper, a desuinter or a suinter, and an opener. By the aid of this condensed apparatus, which is illustrated by the accompanying drawings, the necessity for transporting the wool from one to another of several machines, which is laborious to the operative and injurious to the wool, is obviated, together with other disadvantages attending the treatment in several apparatus preparatory to the washing; further, a large economy in manual labor and a more regular and excellent product are realized. The apparatus works continuously and is entirely automatic.

In the drawings, Figure 1 is a longitudinal sectional elevation of the machine. Fig. 2 is a plan view thereof. Fig. 3 is an end sectional elevation. Fig. 4 is a sectional elevation on an enlarged scale, of the separating-tank. Fig. 5 is a plan of the same. Fig. 6 is an end elevation, partly in section and partly broken away. Fig. 7 is an end elevation of a modification. Fig. 8 is a plan view of a link in the carrier-belt. Fig. 9 is an edge view of the same. Fig. 10 is a longitudinal section of the link on the line 10 10, Fig. 8. Fig. 11 is an end view of the link. Fig 12 is a cross-section of the same on the line 12 12, Fig. 8. Fig. 13 is a plan view of a portion of an intermediate link. Fig. 14 is an end view of the same. Fig. 15 is a cross-section of the same on the line 15 15, Fig. 13. Fig. 16 is a plan view of a portion of the belt on a smaller scale than Figs. 8 to 15. Fig. 17 shows the feeding-chute for the machine and a portion of the receiving end of the same.

The apparatus is composed, essentially, of a tank divided into a series of compartments a' a^2 a^3 a^4 a^5 a^6, which is usually arranged directly in front of the first tank m of the washing-machine, which may be of any system whatever, also of an endless traveling apron v, arranged above the tank, supported by the driven rollers r r r as to its upper part and by the friction-rollers g g g as to its under part. The wool spread upon this apron is conducted by it into the first tank m of the main tank, and during its passage it receives successive sprinklings or artificial rains of the liquids derived from the compartments a' a^2 a^3 a^4 a^5 a^6. These liquids are raised by a battery or series of rotary pumps h' h^2 h^3 h^4 h^5 h^6, placed alternately above and below a horizontal plane and rotated in opposite directions in such a manner that they may be driven by a single belt, as indicated by Fig. 1. Their delivery-pipes each have a part f' f^2 f^3 f^4 f^5 f^6, perforated below with one or more rows of holes of any shape whatever, arranged horizontally above the apron v and perpendicularly to the axis of the machine in such a manner as to form true sprinklers. These liquids drench the wool and remove the suint therefrom.

There are laterally-inclined collectors p' p^2 p^3 p^4 p^5 p^6, arranged between the upper and lower parts of the traveling apron v, each of which receives liquid derived from the corresponding compartments a' a^2 a^3 a^4 a^5 a^6 and allows it to thereafter return through an outlet in its lower side to its original compartment. Nevertheless a special arrangement may permit a portion of this liquid to fall into the neighboring compartment in the direction of the entrance to the machine. In fact, the collectors are arranged above and on each side of each partition between two compartments. The outlet from the collector which permits the liquid to be discharged therefrom is furnished with a hinged clack-valve s, of which the closure rests upon the upper end of the guide-rod of a float i' i^2 i^3

i^4 i^5 i^6, with which each compartment is provided. If the float-rod withdraws because of the descent of the float i^3, for example, the valve s^3 gapes and a part of the liquid from the collector p^4 falls into the compartment a^3. If, on the contrary, the compartment a^2 fills up, its float i^2 rises, and the length of the rod, having been calculated for that purpose, closes the valve when the liquid has attained its upper maximum level. This having been said it is easy to understand the automatic operation of the apparatus, in all the compartments of which the liquids will always have the same level. In short, they can neither contrive to be emptied nor to overflow. It will be evident that the classification of the liquids will be separately made as a matter of course and that the first which traverse the wool will charge themselves with the larger portion of the very soluble suint and other foreign matters, while the following portions will attain a gradually-decreasing density; but then there will arrive a moment, if one treats normal wools, when the first sprinkling liquid will attain a sufficient density to warrant its evaporation and industrial calcination for the production of the potash of the suint or of a special treatment to obtain the useful products. This point varies between 10° and 15° Baumé, corresponding with 1.0744 to 1.1160 of the areometer, and when it is reached the strong suint, which then has a very useful but too energetic chemical action, should be automatically discharged toward an external reservoir. To enable this to be done, the whole or part of the first liquid which has traversed the wool and has been received by the collector p' is directed into a special apparatus provided with decanting-compartments and with a certain simple and practical mechanism for effecting the proper distribution of the liquid. This apparatus is illustrated by Figs. 4, 5, 6, and 7. The tank M, receiving the liquid from the collector p', is divided into two compartments l P' by a partition N, which reaches nearly to the bottom, as shown in Fig. 4. At the upper part of the compartment l is a strainer P. The strained liquid flows under the bottom of the partition N and rises in the compartment P'. The small areometer x which it contains is simply used as a check. The whole of the operation of the apparatus is controlled by the larger metallic float H, which may be of pyramidal or conical form.

The weighted float H is ballasted in such a manner that when it is plunged in a solution marking, for example, 11° Baumé it will remain immersed in the liquid up to the middle of its upper tubular part. The liquid introduced into the balance-compartment P', containing the float H, where it is preserved at a constant level, overflows at the upper part and drains away by the side channels c d, through which it returns to the first compartment a' of the machine. The channel d, which receives a uniform quantity by the inlets R' R^2, which quantity is the maximum discharge-supply, is furnished with a vertically-sliding door or valve, the position of which controls the draining away of the liquid. This door or valve is thus able to make the level of the liquid in the channel rise until it has caused a more or less abundant overflow through the outlet I. All the upward and downward movements of the balanced float H, caused by the variations in the density of the liquid in which the float is plunged, are transmitted to the sliding door or valve by the beam T and attached chains. When the float is at the bottom, the completely-lifted door or valve leaves the passage free for the very weak suint, all of which returns to the compartment a' of the machine. If, following an increase in the density of the suint, the float rises, the door or valve is lowered. It will suffice to regulate its position in such a manner as to insure the discharge of the suint when this latter has attained a predetermined degree, according to the nature and richness of the treated wools. The turnbuckle n permits a precise regulation to be made once for all.

As the circulation in proportion to the volume of liquid received is somewhat rapid in the tank M, the decantation is imperfect, and if one desires to obtain clearer liquids one is able to decant and filter the weak portion of the expelled liquid by making it pass into a second tank M', divided by a partition N' into two compartments P^2. In the last compartment P^2 there is inserted a filtering agent, which may be a perforated box w, inclosing any suitable filtering material whatever of any desired thickness, through which the strong suint must pass from bottom to top to gain the definitive outlet or discharge channel I', whence the liquid passes into an escape-pipe R. Fig. 7 shows a modified construction in which the outlet I discharges directly into the mouth of the escape-pipe R.

The outlets y and y' are for cleansing. The first forms a constant connection between the bottom of the tank M and the compartment a', and the second has a valve y^2, connected by a chain y^3, lever y^4, and shaft y^5 with the starting and stopping mechanism S of the machine in such a manner that when the machine is started the valve will be closed and when it is stopped the valve will be opened. At this moment the level of the liquid in the filtering-compartment descends to the same level as that of the liquid in the compartment a'. In virtue of the law of communicating vessels the decanted heavy parts are carried along first. The filter itself may be cleared by a reverse current.

When the tank a' loses some of its volume, as described, its float i' descends, and consequently effects the withdrawal through the valve s' of an equal quantity of liquid from the collector P^2, and as this collector is fed from the compartment a^2 the result is to effect a lowering of the liquid in the compart-

ment a^2. This compartment a^2 in the same way claims and deducts by its float i^2 a like quantity from a^3, and so on to the last compartment in like manner. The last compartment to maintain its constant level will make a call for water either from the first washing-tank m by a communicating pipe F, having a non-return valve, or directly from a higher reservoir containing hot or cold water charged with detersive matters or not.

The valve b in the pipe leading from this reservoir has a flat rod-key pierced with an opening through which engages a finger fixed upon the float guide-rod. The latter then controls all the movements of the valve, the finger b' being placed at such a height as to prevent all overflow from the last compartment. This water can be directed in fine sprinkling threads upon the wool, which is thus finally rinsed and completely deprived of the last trace of alkalinity. It is important to remark here that the final sprinkling is constant, as it is indirectly caused by the loss of volume which the first compartment a' of the machine suffers and that this loss is continuous. In fact, even when the wools will not produce suint in a high degree the compartment a' continually loses part of its liquid which has first sprinkled the wool. As the wool is generally supplied in the dry state, it necessarily absorbs and carries away a certain part of the liquid.

Deposited dirt and foreign matters may be removed from the compartments through the covered manholes a^7 a^7.

The wool is retained upon the traveling apron by the side pieces j j.

e e are interceptors or perforated plates placed over the compartments a' a^2, &c. h^7 is the elbow of the pump suction-pipe, and h^8 a box for holding the deposited matters, and l' l' are pressure-rollers upon the layer of wool and which have for their object to hasten and render more complete the expulsion of the liquids. The rollers l' l' may vary in number and any suitable device may be employed whereby the pressure may be regulated as desired.

When dry or defective wools are treated, excellent results are obtained by treating them in the machine with suint previously obtained from other wools. The machine thus becomes a true suinter and will restore to such wools their original nature and suppleness and render their washing easier and more economical.

In order that in machines of relatively-restricted dimensions the wool may have a soaking of sufficient duration without being exaggerated, a type of traveling apron has been sought which shall be practical and of sufficient strength to be able to carry without too great wear and tear a layer of soaked wool having a width of about thirty-two to thirty-nine inches and a thickness which may reach to from twenty to twenty-three inches. Such an apron has been devised and is illustrated by Figs. 8 to 16, inclusive. By its aid a good feeding of the main tank is assured, and a complete soaking is effected in from fifteen to twenty-five minutes. The apron may be made of any suitable metal, its elements are well proportioned, and their assembly is easy. It is composed of perforated links A A, having lugs B B on opposite sides of the links, the lugs on one side breaking pitch with those on the other side. All the lugs are bored or have holes produced through them, as indicated by the drawings, through which the articulation-rods C can be passed. A row of the links having been arranged end to end, one of the articulation-rods is passed through all the lugs on one side of the links after a second row has been arranged, with the contiguous lugs of the two rows interlocking. The articulation-rod is then secured at each end by the pinned-on collars f f, and other rows of links may be added in like manner until the necessary length has been completed. The two ends of the apron are then connected by another articulation-rod.

It has already been stated that a complete soaking is effected in from fifteen to twenty-five minutes. Because of the consequent comparatively-slow motion of the apparatus regularity of feed and economy of labor are obtained and the same results as by the employment of mechanical feeders. In fact, several of the traveling aprons may be easily and practically fed by a single operative, and the layer is always sensibly uniform because of its firm thickness and the time the operative has at his disposal to make it.

I have further devised a kind of feeding-chute which permits the very regular supply of wool to the apparatus from the first floor. This descending conduit D, Figs. 1 and 17, is like a nearly-vertical prolongation of the traveling apron, and it permits the gaging and the regulation, as may be desired, of the volume of wool which should enter for treatment. The side of the chute toward the machine is hinged at its upper part, so that the lower end of this side or panel k may be made to occupy a position more or less remote from the opposite side t, according as it may be desired that the rate of supply of the wool should be increased or diminished. Triangular extensions E may be attached either to the sides of the chute or to the edges of the panel k, as shown by dotted lines in Fig. 17, to prevent a lateral opening being produced in the chute when the panel k is moved outward. With this installation a single operative may easily feed three or four main tanks. Finally, manufacturers who have no interest in preserving wools in entire fleeces as they exist after having passed through the hereinbefore-described apparatus may, if they so desire, beat their wools in the dry state without additional labor by installing their beating-machines in front of the apparatus in such a manner that the beaten wool may be received upon the traveling apron v or by the chute D; but they

will have greater facility for opening and disentangling the fleeces in the wet condition and in a less brutal and dangerous manner for the filaments by substituting an opening-drum for the ordinary immersing-drum C of the washing-machine. It suffices, as indicated by Figs. 1 and 2, to arm the wings or strips on this drum with combs composed of metallic needles slightly inclined with reference to the produced radius. The stripping of the endless apron is thus facilitated and there is produced a regular fall of the wool—that is to say, in the most favorable conditions for the rapid achievement of a perfect washing.

A blade flier furnished at its outer extremities with leathers may equally be employed for detaching the wool at the outlet of the machine and projecting it upon the immerser of the washing-machine or upon an intermediate traveling apron conducting to that machine.

The apparatus may be employed for the preparation of wools for ordinary washing and in their preparation for treatment by volatile hydrocarbon for the removal of greasy matters.

It is to be understood that the description hereinbefore given is intended to indicate the preferred mode of carrying out my ideas and that numerous modifications may be applied with respect to the number, nature, and arrangement of the different elements which compose the apparatus.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In a machine for washing wool, the combination with a main tank divided into compartments, of an endless carrier-belt arranged to travel over said tank, means for raising liquid from each compartment and spraying it upon said belt, collectors under the upper portion of said belt to receive the liquid, a valve in the bottom of each collector controlling the discharge of liquid therefrom, and a float in each compartment arranged to operate said valve.

2. In a machine for washing wool, the combination with a main tank divided into compartments, of an endless belt traveling over said tank, a pipe supplying water to the compartment at one end of the tank, pumps for transferring water from one compartment to the next, and a settling-tank at the opposite end of the tank from the water-pipe.

3. In a machine for washing wool, the combination with a main tank, of a settling-tank, a conduit conveying the overflow from the settling-tank to the main tank, a hydrometric float in said settling-tank, and a valve in said conduit connected with said float.

4. In a machine for washing wool, the combination with a settling-tank having a partition extending nearly to its bottom, of a strainer at the top of one of the thus-formed compartments, a hydrometric float in the other compartment, a conduit receiving the overflow from said second compartment, a gate-valve in said conduit connected with said float, and a second settling-tank into which the liquid flows when the valve is closed.

5. In a machine for washing wool, the combination with the main tank, of a settling-tank, automatic means for directing the overflow from the settling-tank through one or the other of two outlets, and a second settling-tank connected with one of said outlets.

6. In a machine for washing wool, the combination with the main tank, of two settling-tanks, and automatic means for directing the overflow from the first settling-tank either to the main tank or to the other settling-tank in accordance with the density of the liquid.

7. In a machine for washing wool, the combination with a main tank, of a settling-tank M′, having the partition N′, the filter *w*, a pipe leading from the bottom of the tank M′ to the main tank, a valve in said pipe, and connections between said valve and the stopping and starting mechanism of the machine.

8. In a machine for washing wool, the combination with an endless carrier-belt, of an inclined feed-chute, having one side hinged at its upper end, and provided with side flanges overlapping the adjacent sides of the chute.

9. In a machine for washing wool, an endless carrier-belt composed of links provided with openings through the body portion, and having lugs along each edge, said lugs being beveled off along their upper sides.

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

GEORGES MALARD.

Witnesses:

A. F. CERBAUX,

C. CARLINE.