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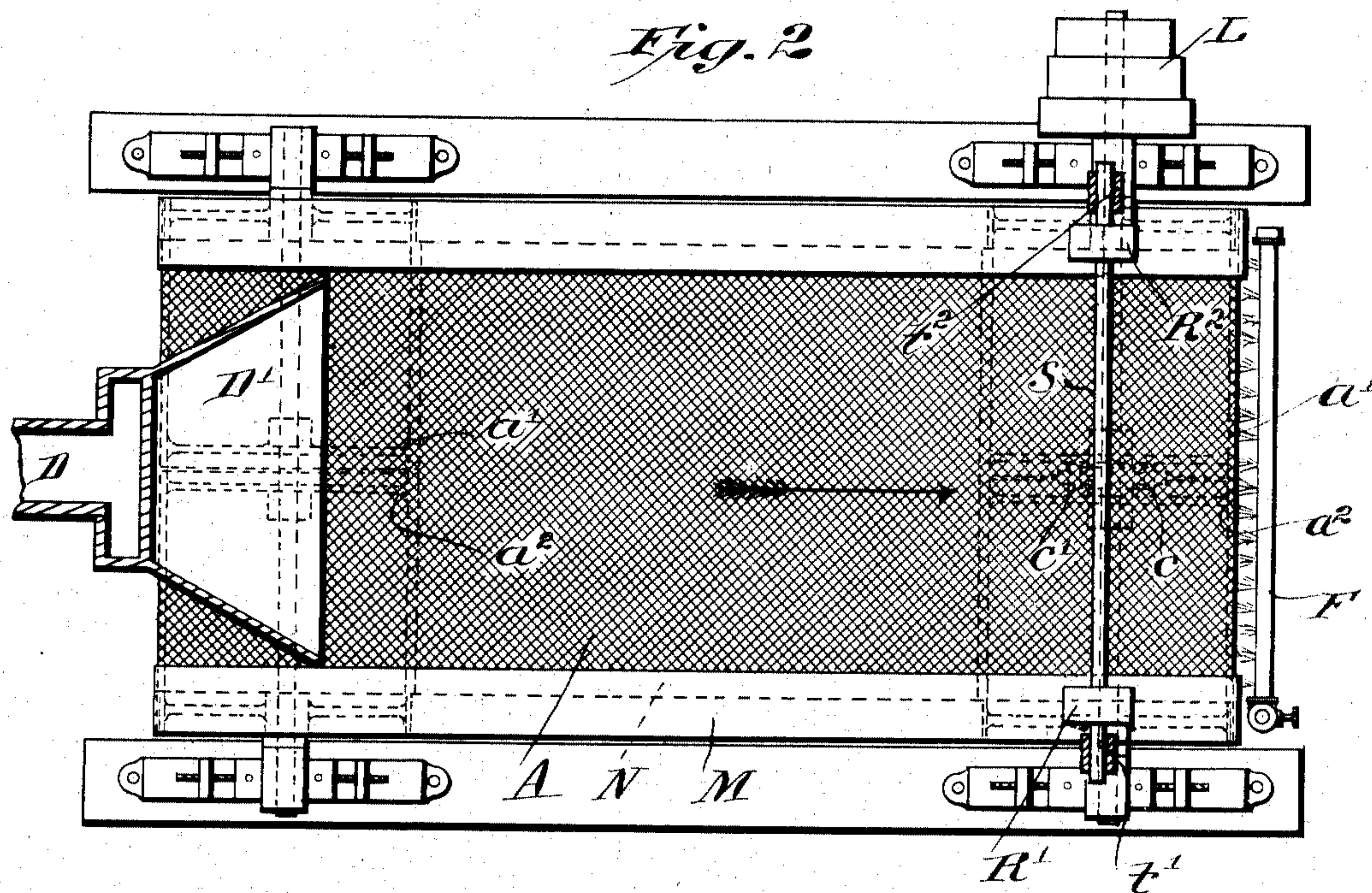
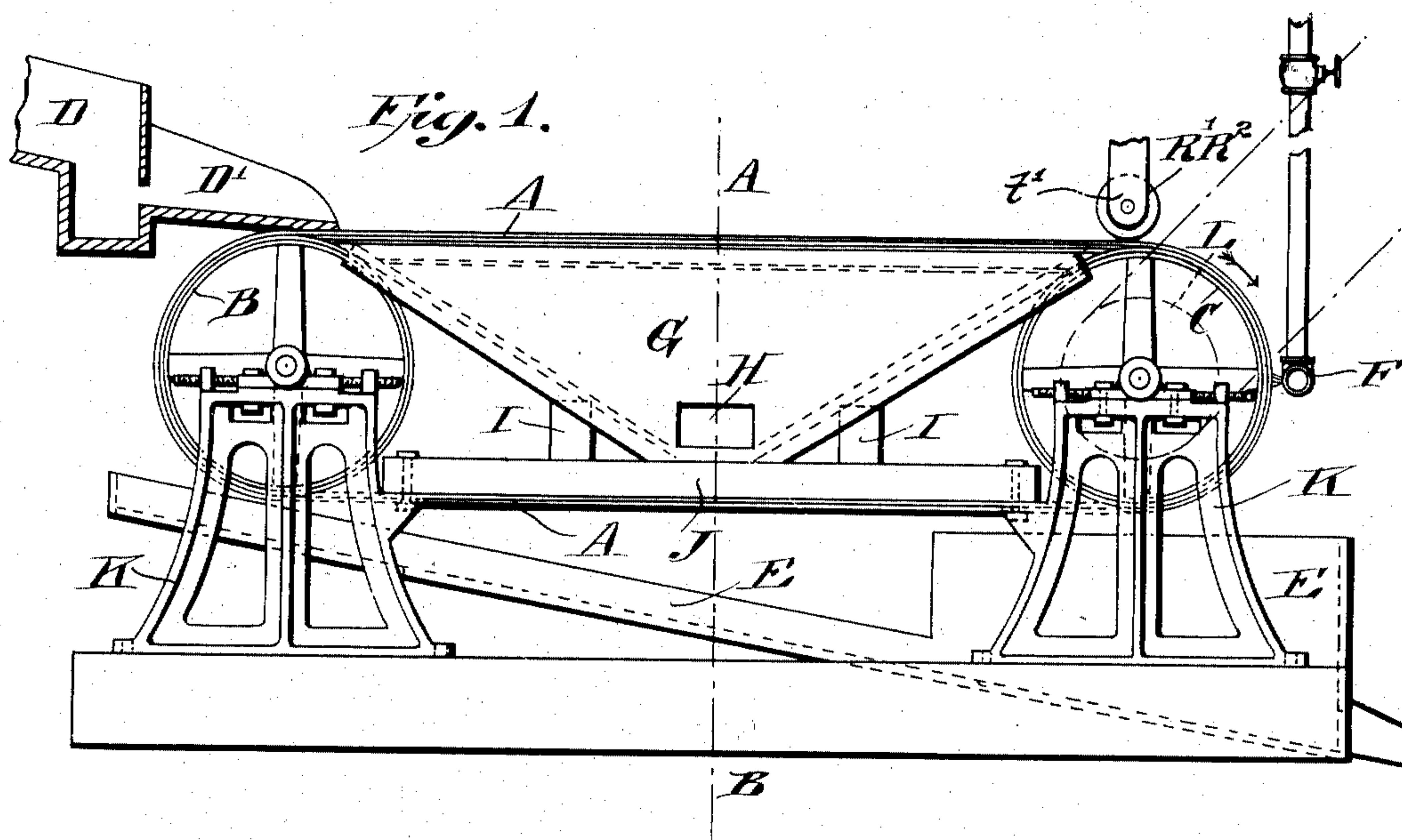
PATENTED SEPT. 3, 1907.

J. M. CALLOW.

SCREEN SIZING AND SEPARATING MACHINERY.

APPLICATION FILED JULY 13, 1905. RENEWED JUNE 1, 1906.

4 SHEETS—SHEET 1.



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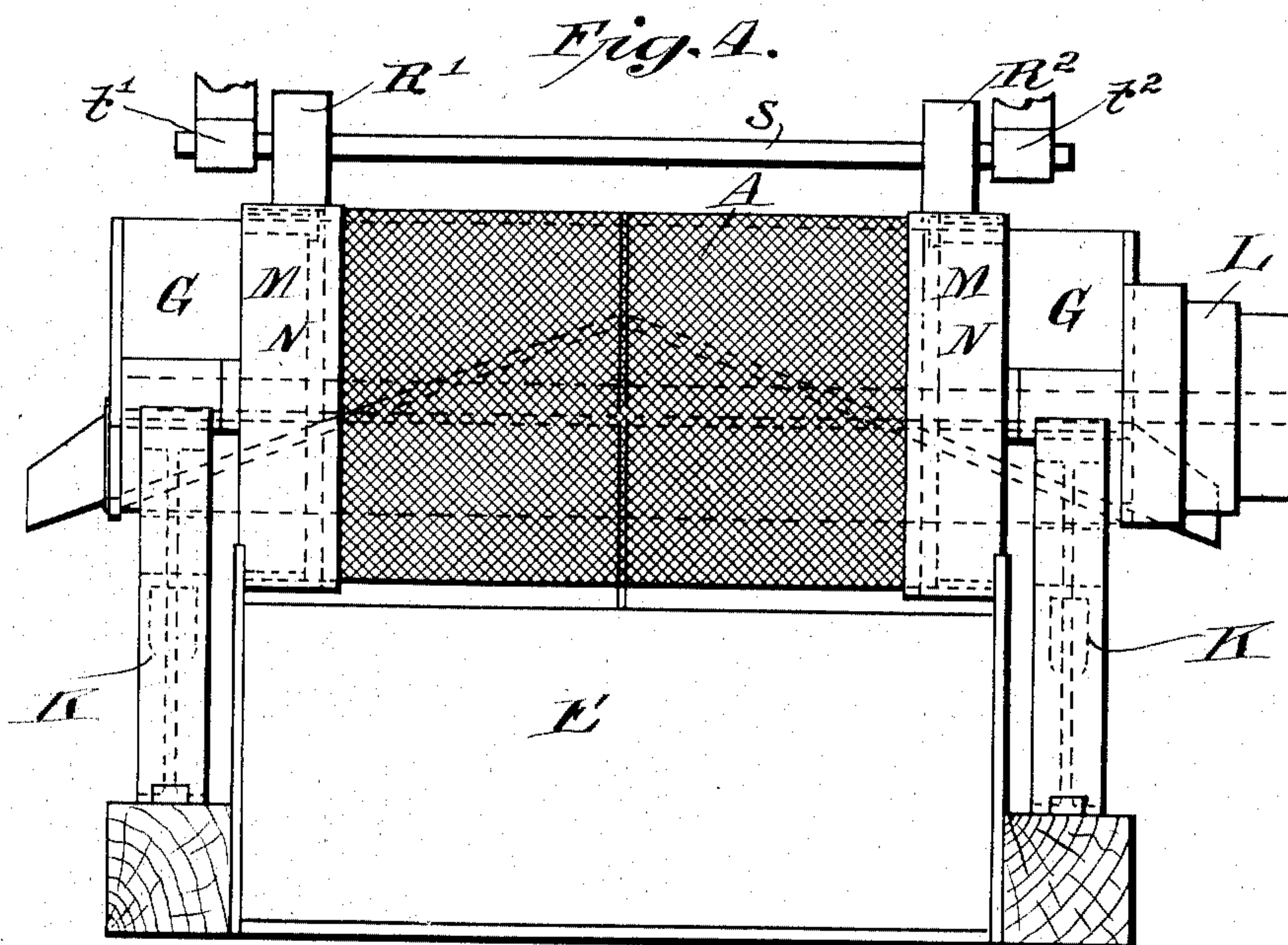
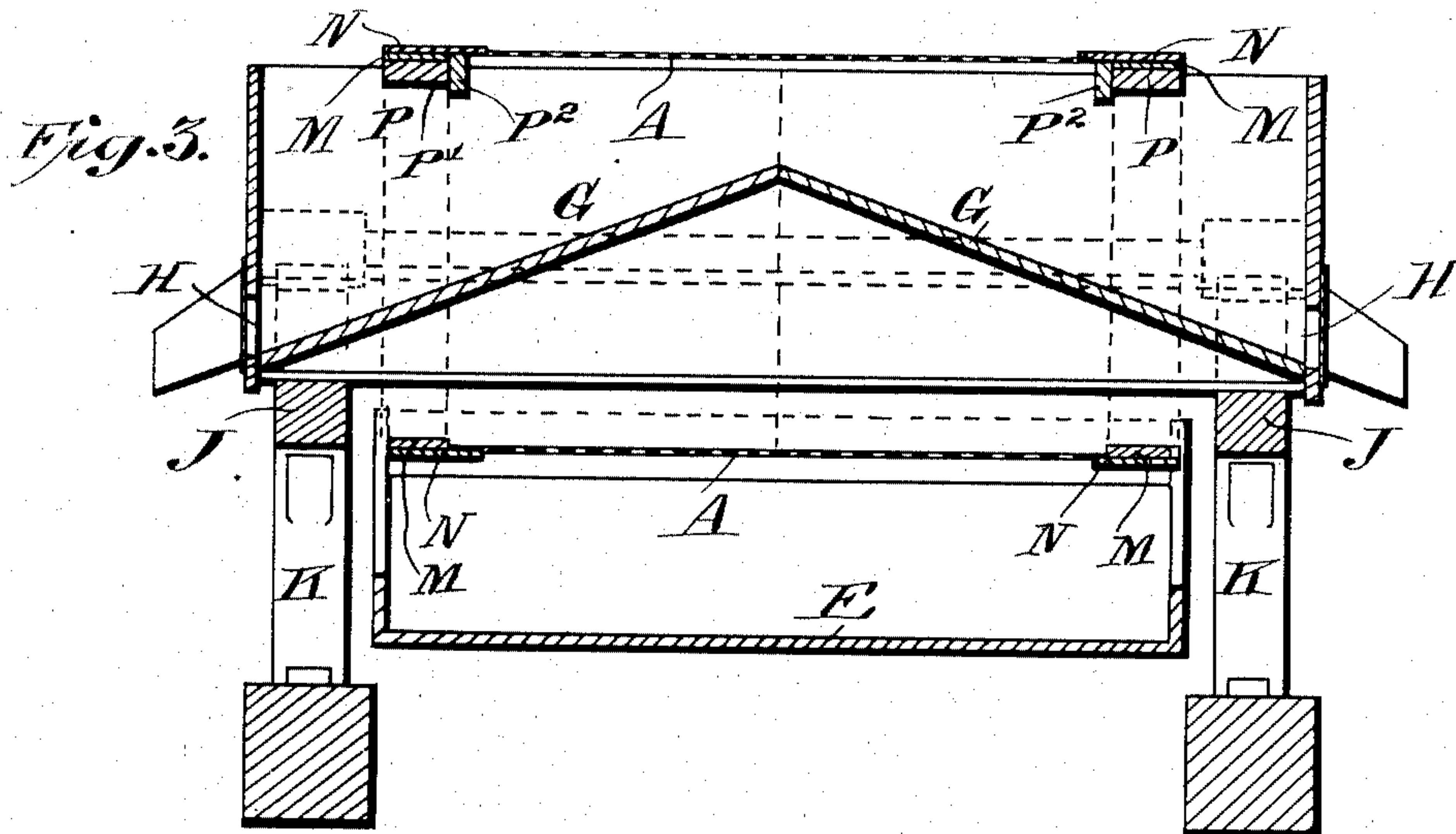
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4 SHEETS—SHEET 2.



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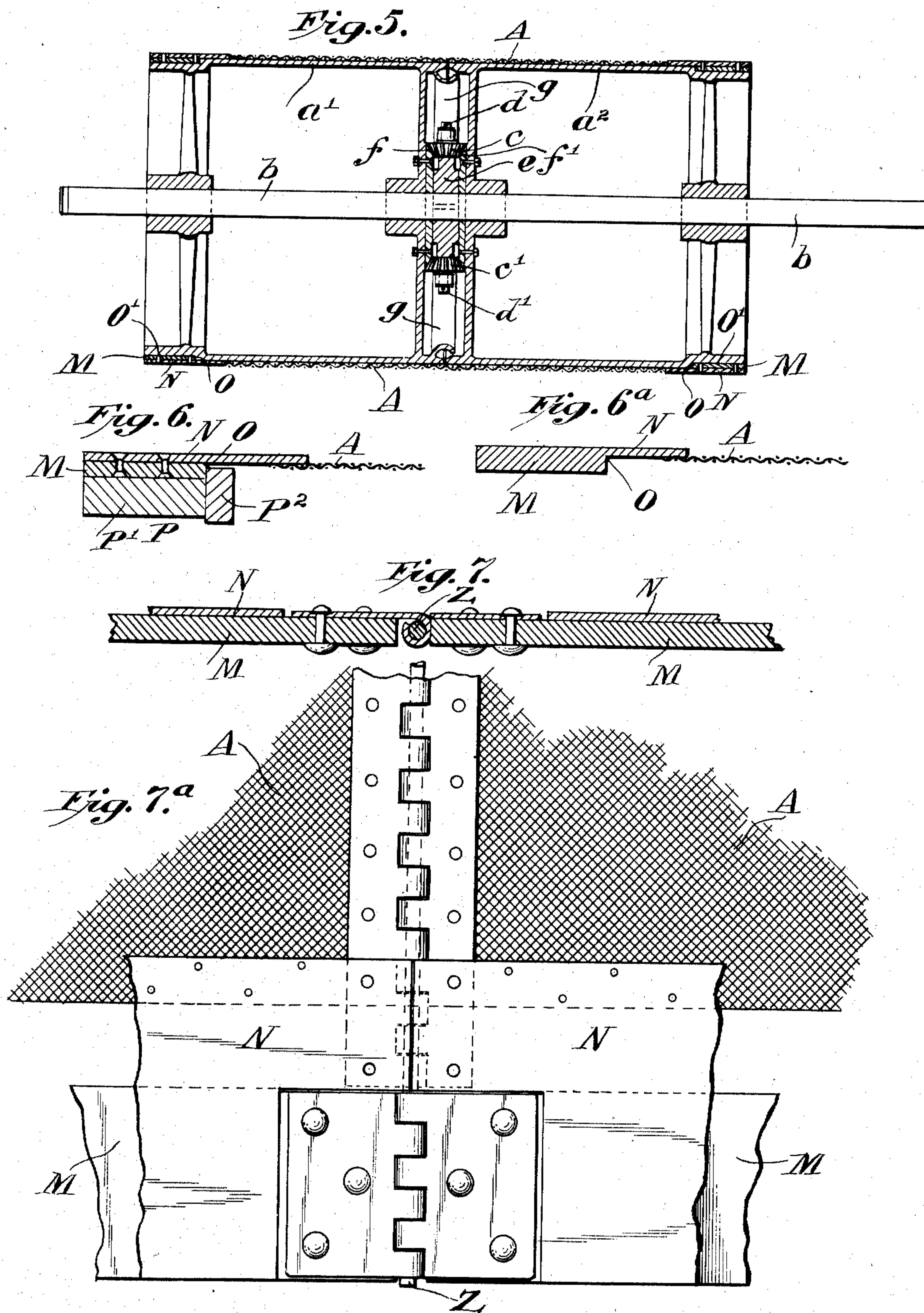
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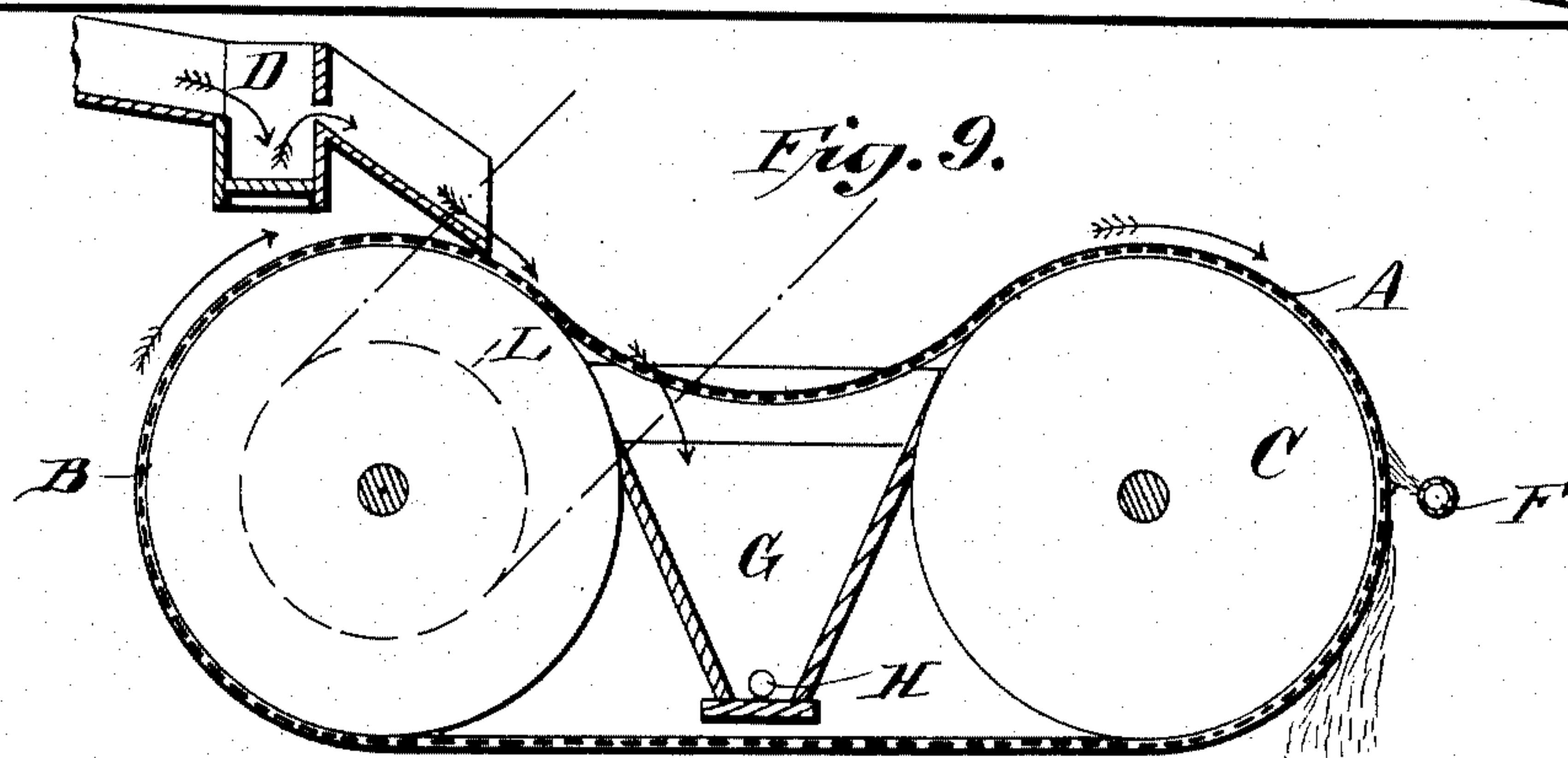
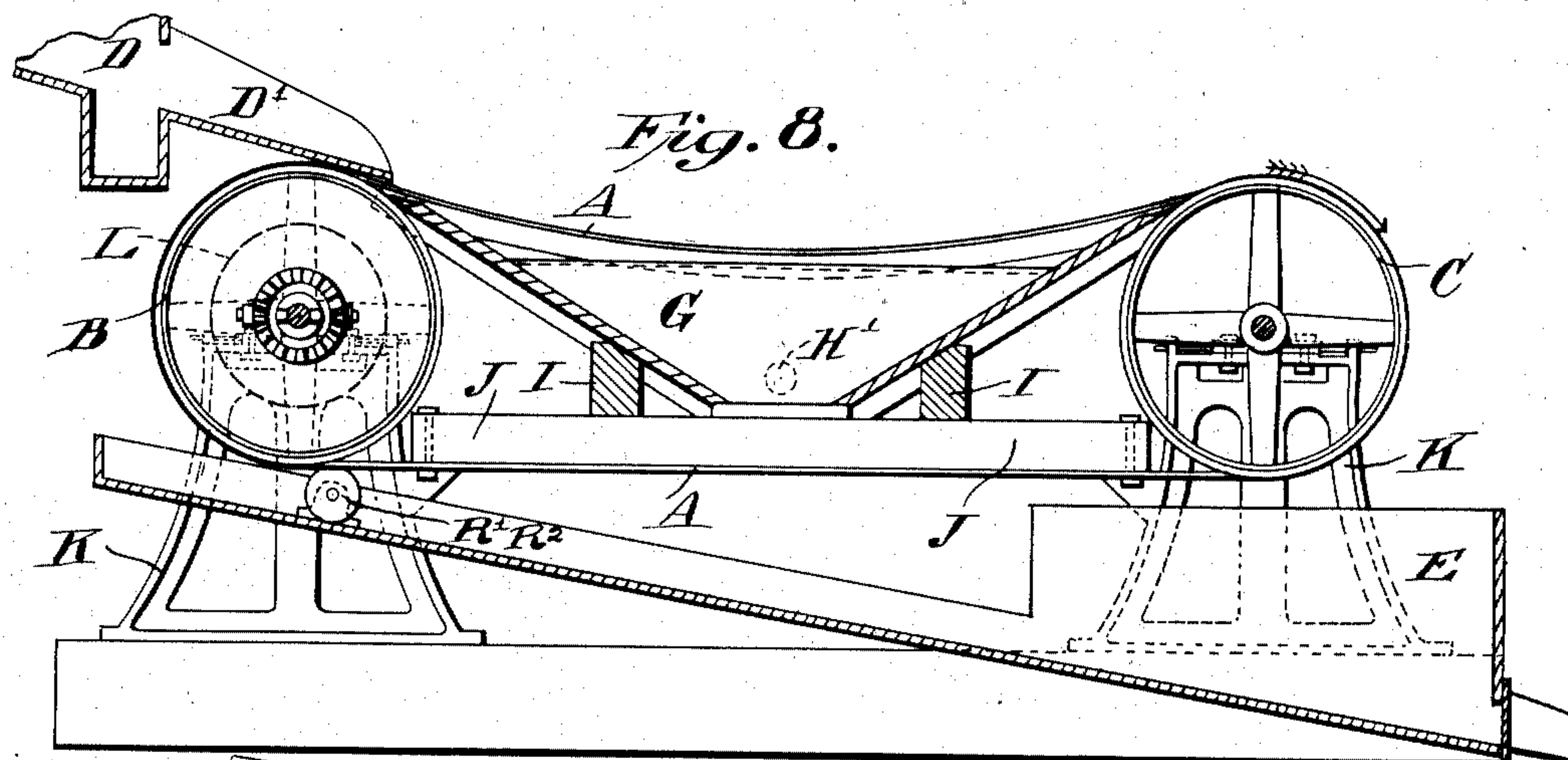
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4 SHEETS—SHEET 4.



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UNITED STATES PATENT OFFICE.

JOHN M. CALLOW, OF SALT LAKE CITY, UTAH.

SCREEN SIZING AND SEPARATING MACHINERY.

No. 864,828.

Specification of Letters Patent.

Patented Sept. 3, 1907.

Application filed July 13, 1905, Serial No. 269,463. Renewed June 1, 1906. Serial No. 319,772.

To all whom it may concern:

Be it known that I, JOHN M. CALLOW, a subject of Great Britain, and a resident of Salt Lake City, Utah, have invented certain new and useful Improvements in
5 Screen Sizing and Separating Machinery, of which the following is a specification accompanied by drawings.

This invention relates to improvements in screen sizing and separating machinery and more particularly to that class of machines in which an endless traveling
10 band or belt of screen cloth is used for separating the coarse from the fines.

A machine constructed in accordance with this invention is designed more especially for screening finely divided and wet materials although it may be used
15 with any kind of material to which it is applicable. The machine is preferably used for the wet sizing and separating of ores, minerals, gravel, sand, earth and earthy materials, bone ash, cement and other like materials, when in a sub-divided, granular or pulverized
20 condition. It may incidentally be used for the removing and separating of these and like materials from water or other liquids.

The objects of the invention are to improve upon the class of machines above referred to, simplify and
25 cheapen their construction with increased efficiency in operation, prevent undue bending or straining of the screencloth as it passes over the rollers and equalize the tension in the belts.

To these ends the invention consists of apparatus for
30 carrying out the above objects, embodying the features of construction, combinations of elements and arrangement of parts, having a general mode of operation substantially as hereinafter fully described and claimed in this specification and shown in the accompanying
35 drawings, in which,—

Figure 1 is a longitudinal side elevation of machine; Fig. 2 is a plan view of machine; Fig. 3 is a transverse sectional view of machine on line A and B of Fig. 1; Fig. 4 is an end elevation of machine; Fig. 5 is a sectional view of the driving rollers; Figs. 6 and 6^a are enlarged detail transverse partial end views of the cloth and its carrying belts and edges; Figs. 7 and 7^a are partial enlarged detail edge and plan views respectively of the means for joining the ends of the screen cloth;
40 Figs. 8 and 9 are side elevations of modified forms of machines.

According to this invention the end shake of the screen is dispensed with, because with certain materials and under certain practical conditions of actual
50 work I have found that the irrigation of the screen and the end shake of the machine are not absolutely necessary for the production of excellent results and I am thus enabled to simplify the machine in these respects for certain kinds of work and at the same time I have

added certain improvements all of which will herein- 55 after appear.

Referring to the drawings, A represents the screen cloth shown in this instance in the form of an endless band or belt passing over the head roller B and the tail or driving roller C, the direction of travel being indicated by the arrows. The feed box D is provided with a sole plate or distributing board from which the materials to be screened are fed across the full width of the screen cloth A.
60

A wide catch box E or launder extends the full width 65 and length of the machine to catch any drips from the lower or return side of the belt, and the oversize as it is delivered at the tail roller C at the end of the machine. A spray pipe F is provided for spraying off the oversize delivered by the roller C into the catch launder E.
70

The hopper G under the working side of the screen belt catches the water and undersize that has passed through the machine and conveys it away. This hopper G consists of sloping ends extending from roller to roller, and transverse slopes within the same, discharging the watery undersize product to the side opening H from whence it can be conveyed for subsequent treatment. The hopper is shown supported by cross timbers I on longitudinal timbers J fastened to brackets on the floor stands K which latter also support the boxes 80 and shafts carrying the rollers B and C respectively.

L are driving pulleys, by which power is applied to the machines and the belt A caused to travel.

The screen cloth is shown in enlarged section in Fig. 6. A is the screen cloth, and N is an endless belt 85 much thinner and more flexible than N to which is fastened the delicate screen cloth, by sewing, tacking or stapling, or in some equally suitable and convenient manner. This belt N is in turn fastened to the main belt M, or it may be made part of it as Fig. 6^a.
90

Extending from roller to roller within the hopper G are guide boards P which fit up under the shoulders O of the belt, and guide the belt laterally. Corresponding grooves O' are provided in the rollers A & C, as shown in enlarged view in Fig. 5. The guide boards P comprise horizontal legs P' which support the weight of the belts and prevent them and the screen cloth from sagging down between the rollers, and vertical leg P² which prevents the tendency of the belts to curve towards each other by any sagging of the belt transversely by reason of the weight of material resting on it and thus keeps the screen cloth tight and flat across its full width. As a further means for guiding the belts M laterally two bearing-down wheels R' R² are placed above the roller C to press the belts down into the grooves and prevent any possibility of their climbing up on the roller at the shoulder point O. In the case of the machine shown in Fig. 8 these rollers are,
100 105

of course, on the under side of roller B, since the leading or tight side of the belt in this machine is underneath. The bearing-down rollers R' R^2 are part of the shaft S which extends across the machine and runs in suitable bearings t' t^2 .

A great desideratum in the operation of the screen and in preserving the life of the screen cloth is to avoid all undue or cross strains upon the delicate screen cloth, and it is for this purpose that the screen and its carrying belts are constructed as described, and shown in Figs. 6 and 6^a. The main driving belt M is stiff and comparatively inflexible, and if the screen were attached directly to it, strains would be set up in the cloth in its travel over the rollers that would break and destroy it along its line of juncture in the course of time, and to avoid this result, the supplementary belt piece N is interposed, which extends a substantial distance beyond belt M and being of much more flexible and pliable material enables the screen to travel over the rollers without bending and distortion. Further, to prevent and avoid diagonal strains upon the screen cloth it is again important that the strain or pull on each of the belts M shall be substantially the same and at all times balanced, and since the belts are seldom or never precisely the same length, and the rollers are not generally precisely the same diameter at both ends, a special driving roller is therefore provided because the slightest variation in diameter would cause one side of the screen belt to travel faster than the other and thus put a diagonal strain upon the cloth. This roller (Fig. 5) consists of two similar main parts a' a^2 , both loose upon the shaft b , and driven by means of the differential gearing shown, in which c c' are bevel pinions free to revolve on the studs d and d' , connected to the hub e which is keyed to the shaft b and revolves therewith. The pinions c c' mesh with gears f f' connected to the rollers a' and a^2 , the rollers will revolve with the same speed so long as the tension of the two belts M remains the same, but any alteration in the relative tension of the two belts will cause the bevel pinions to revolve till the pull on both belts is again equal. To protect the gearing against dirt or grit the curved shield g is provided at the opening at the junction of the rollers.

The head roller B is in two parts like the driving roller C, but one half is keyed to the shaft, the other is loose thereon, and no differential or equalizing gearing is here necessary, because the back rollers follow the rotation of the driving rollers by means of the driving belts M. For convenience in putting on new or removing worn out cloth, the screen bands and their carrying belts are made in a single length and after passing the ends over the rollers in the machine, the two ends are brought together and joined by a hinge and pin fastener Z (Figs. 7 and 7^a) which connects hinges Y suitably secured to the cloth.

Obviously, some features of my invention may be used without other features and the invention may be embodied in widely varied forms; one modification is shown in Fig. 8 in which instead of the tail roller C being the driving roller, the power is applied to the head roller B thus causing the bottom side of the belt A to become the tight side and the top side to sag down into the hopper. Further, under some conditions it may be advantageous to submerge the screen

and in that case instead of the watery undersize having a free exit through the opening H, this orifice may be plugged as at H' (Fig. 8) thereby raising the water sufficiently in the hopper to submerge the screen. Fig. 9 shows in diagram another variation, in which the ratio between the diameter of the rollers and their distance apart is reduced without in any way departing from the fundamental principle of the invention.

The action is substantially identical in all the machines, the same fundamental principle being common to them all, viz., a continuously traveling band or belt of screen cloth, the materials and water being fed to it so as to give a skimming action on the cloth, the fines passing through and the oversize being retained and carried forward to be afterwards sprayed off as soon as it is beyond the screening area. The faster the cloth travels, the greater the quantities handled and the better quality of the work performed, its efficiency being due to the continuous presentation of a fresh clear and unblinded screening surface on which to receive the onflowing pulp.

The operation of the machine is as follows: The belt is driven by power applied to the pulleys L, and the material to be screened together with its accompanying water, is allowed to flow onto the screen belt from the feed launder D over the distributing apron D' and is by it distributed across its whole width as a thin stream or film, the distributing apron being set at an angle as nearly in line with the screen belt as possible. The water and materials skim over the surface of the screen, and the fines and water pass through the meshes while the oversize is retained and carried forward still clinging to the screen. The oversize over the roller C and at a point about mid-diameter thereof, passes in front of the sprays from the pipe F which impinging on the cloth tightly stretched over the roller, wash it off into the launder E below. During all this time a fresh and thoroughly cleansed screen cloth is being presented to the onflowing water from D D' at the other end of the machine and the operations continue without intermission so long as the machine is kept in motion and furnished with materials. The machine is run at a speed to correspond with the quantity of material to be handled, and the quality of the work performed is also regulated by the speed at which the belt is run, which may be varied as desired as by means of the stepped pulleys L. Under some conditions the speed may be so slow that the oversize deposited may be of considerable thickness, under others the speed must be increased so that the oversize may not be more than the diameter of one grain thick, each individual case requiring special adjustment and regulation in this respect.

I do not herein claim anything disclosed and claimed in my co-pending application, Serial No. 286,738, filed Nov. 10, 1905.

Therefore, not limiting my invention to any one of the arrangements shown and described, nor enumerating further equivalents, I claim and desire to obtain by Letters Patent the following:

1. In a screen sizing and separating machine, the combination with an endless traveling belt or band of screen cloth, of an end roller constructed in two parts and differential gearing for driving said parts for equalizing the tension in the screen.

2. In a screen sizing and separating machine for screen-

ing wet material, the combination with the end rollers, of a single layer endless continuous traveling belt or band of fine meshed perforated screen cloth, main side belts and supplementary belts of more pliable material than the main belts for connecting the screen cloth to the said main belts, thereby preventing undue bending strain on the screen cloth on passing over the rollers.

3. In a screen sizing and separating machine, the combination with an endless traveling belt or band of screen cloth and its end rollers, a feed box at the receiving end of the screen having a sole plate or distributing board from which the materials to be screened are fed across the full width of the screen, a catch box or launder extending the full width of the machine, a hopper beneath the screen for catching the under size and water, and means for spraying water on the tail or oversize roller for removing the oversize from the screen, said hopper beneath the screen having sloping ends, longitudinal transverse slopes for the bottom and a side opening.

4. In a screen sizing and separating machine, the combination with an endless traveling belt or band of screen cloth and its end rollers, a feed box at the receiving end of the screen having a sole plate or distributing board from which the materials to be screened are fed across the full width of the screen, a catch box or launder extending the full width of the machine, a hopper beneath the screen for catching the undersize and water, means for spraying water on the tail or oversize roller for removing the oversize from the screen, said hopper beneath the screen having sloping ends, longitudinal transverse slopes for the bottom and a side opening, and means for submerging the screening side of the screen.

5. In a screen sizing and separating machine, the combination with an endless traveling belt or band of screen cloth and its end rollers, a feed box at the receiving end of the screen having a sole plate or distributing board from which the materials to be screened are fed across the full width of the screen, a catch box or launder extending the full width of the machine, a hopper beneath the screen for catching the undersize and water, means for spraying water on the tail or oversize roller for removing the oversize from the screen, said hopper beneath the screen having sloping ends, longitudinal transverse slopes for the bottom and a side opening, and means for varying the speed of the screen.

6. In a screen sizing and separating machine, the combination with an endless traveling belt or band of screen cloth and its end rollers, a feed box at the receiving end of the screen having a sole plate or distributing board from which the materials to be screened are fed across the full width of the screen, a catch box or launder extending the full width of the machine, a hopper beneath the screen for catching the undersize and water, means for spraying water on the tail or oversize roller for removing the oversize from the screen, said hopper beneath the screen having sloping ends, longitudinal transverse slopes for the bottom and a side opening, and means for guiding the screen laterally.

7. In a screen sizing and separating machine, the combination with an endless traveling belt or band of screen cloth and its end rollers, a feed box at the receiving end of the screen having a sole plate or distributing board from which the materials to be screened are fed across the full width of the screen, a catch box or launder extending the full width of the machine, a hopper beneath the screen for catching the undersize and water, means for spraying water on the tail or oversize roller for removing the oversize from the screen, said hopper beneath the screen having sloping ends, longitudinal transverse slopes for the bottom and a side opening, means for guiding the screen laterally, and means for vertically supporting the screening side of the screen.

8. In a screen sizing and separating machine, the combination with an endless traveling belt or band of screen cloth and its end rollers, a feed box at the receiving end of the screen having a sole plate or distributing board from which the materials to be screened are fed across the

full width of the screen, a catch box or launder extending the full width of the machine, a hopper beneath the screen for catching the undersize and water, means for spraying water on the tail or oversize roller for removing the oversize from the screen, said hopper beneath the screen having sloping ends, longitudinal transverse slopes for the bottom and a side opening, means for guiding the screen laterally, means for vertically supporting the screening side of the screen, and means for preventing the sagging of the screen transversely.

9. In a screen sizing and separating machine, the combination with an endless traveling belt or band of screen cloth and its end rollers, a feed box at the receiving end of the screen having a sole plate or distributing board from which the materials to be screened are fed across the full width of the screen, a catch box or launder extending the full width of the machine, a hopper beneath the screen for catching the undersize and water, and means for spraying water on the tail or oversize roller for removing the oversize from the screen, said hopper beneath the screen having sloping ends, longitudinal transverse slopes for the bottom and a side opening, guide bars extending longitudinally of the machine and supporting the upper side of the screen, said guide bars having horizontal legs for supporting the screen, and vertical legs for preventing the screen from curving and sagging transversely.

10. In a screen sizing and separating machine, the combination with an endless traveling belt or band of screen cloth and its end rollers, a feed box at the receiving end of the screen having a sole plate or distributing board from which the materials to be screened are fed across the full width of the screen, a catch box or launder extending the full width of the machine, a hopper beneath the screen for catching the undersize and water, means for spraying water on the tail or oversize roller for removing the oversize from the screen, said hopper beneath the screen having sloping ends, longitudinal transverse slopes for the bottom and a side opening, and bearing down wheels cooperating with the tail roller.

11. In a screen sizing and separating machine, the combination with an endless traveling belt or band of screen cloth and its end rollers, the driving roller being constructed in two parts, and differential gearing for driving said parts for equalizing the tension in the screen, a distributing feed board or apron at the receiving end of the screen, a hopper beneath the screen for catching the undersize and water, and means for spraying water on the tail or oversize roller for removing the oversize from the screen.

12. In a screen sizing and separating machine, the combination with an endless traveling belt or band of screen cloth, of guide bars extending longitudinally of the machine for supporting the upper side of the screen, said rollers and guide bars being constructed to cooperate with the screen, whereby said screen is guided and prevented from curving and sagging transversely, a distributing feed board or apron at the receiving end of the screen, a hopper beneath the screen for catching the undersize and water, and means for preventing a diagonal strain from being placed upon the cloth in passing over the rollers.

13. In a screen sizing and separating machine, the combination with an endless traveling belt or band of screen cloth, of end rollers for the same, one of said rollers being constructed in two parts, one of said parts being fast upon the shaft and the other loose thereon, and the other roller being constructed in two parts and differential gearing for driving said parts for equalizing the tension in the screens, means for feeding material to the screen, and a hopper beneath the screen for catching the undersize and water.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

JOHN M. CALLOW.

Witnesses:

FRANK E. JOHNSON,
LEONARD CAHOON.