

1,247,427.

W. K. LIGGETT,
SCREENING MECHANISM.
APPLICATION FILED APR. 7, 1914.

Patented Nov. 20, 1917.
3 SHEETS—SHEET 1.

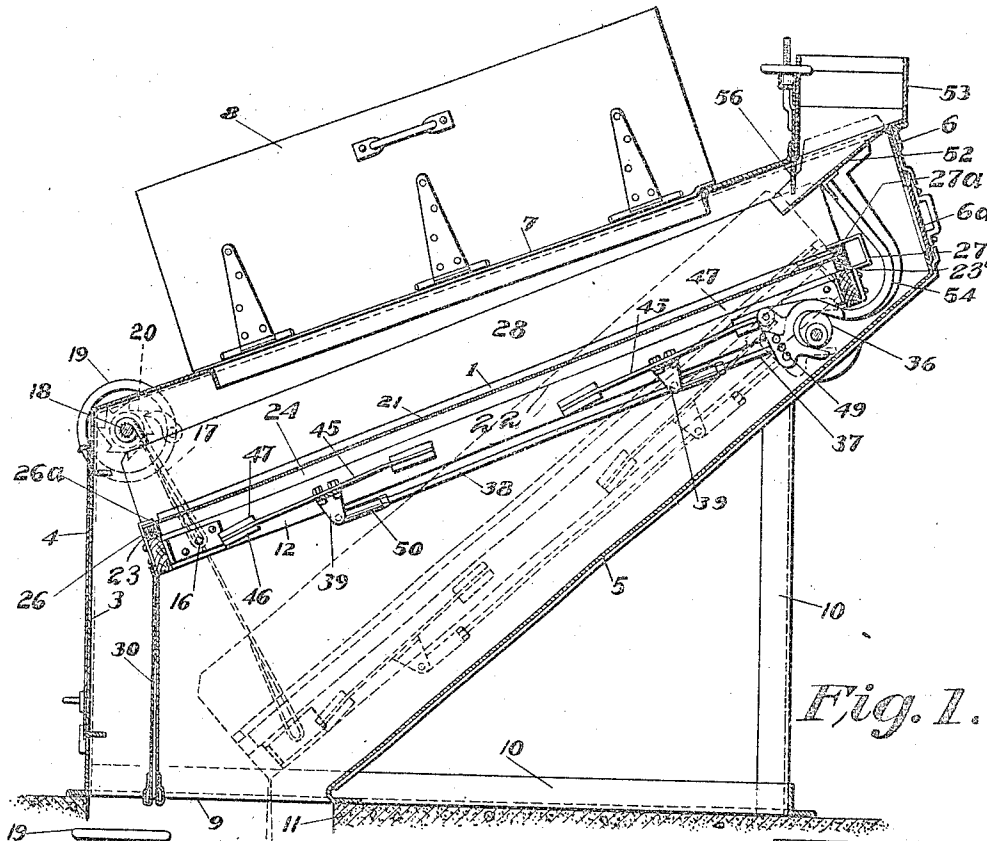


Fig. 1.

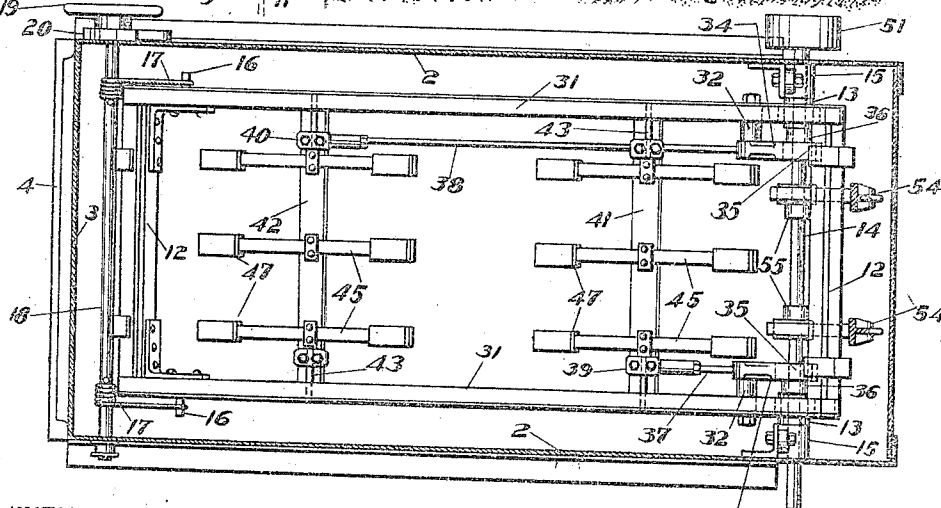


Fig. 2.

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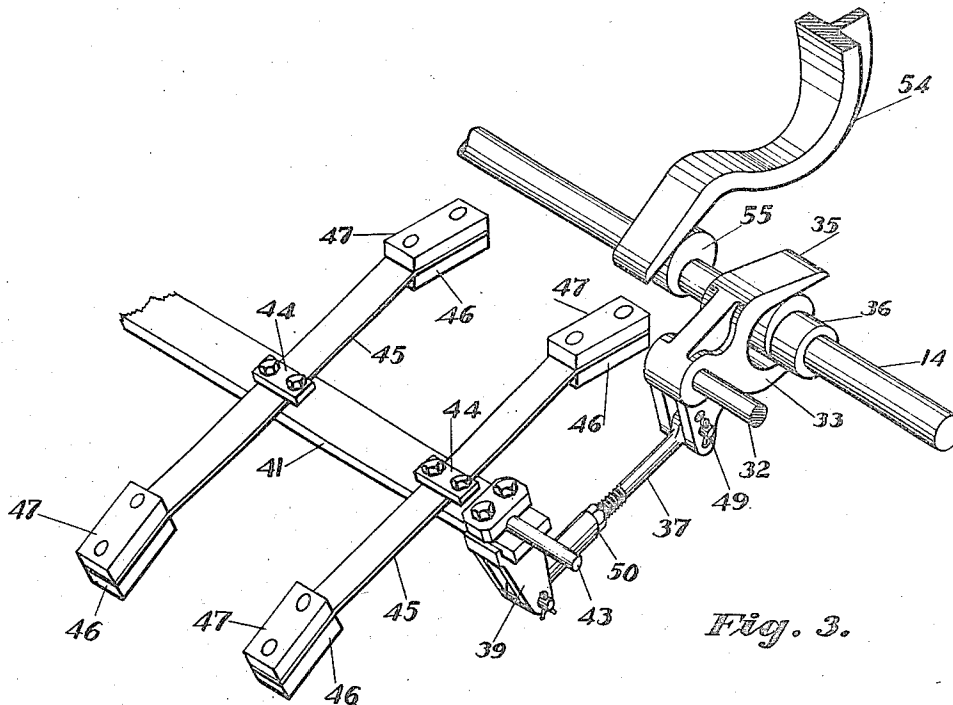


Fig. 3.

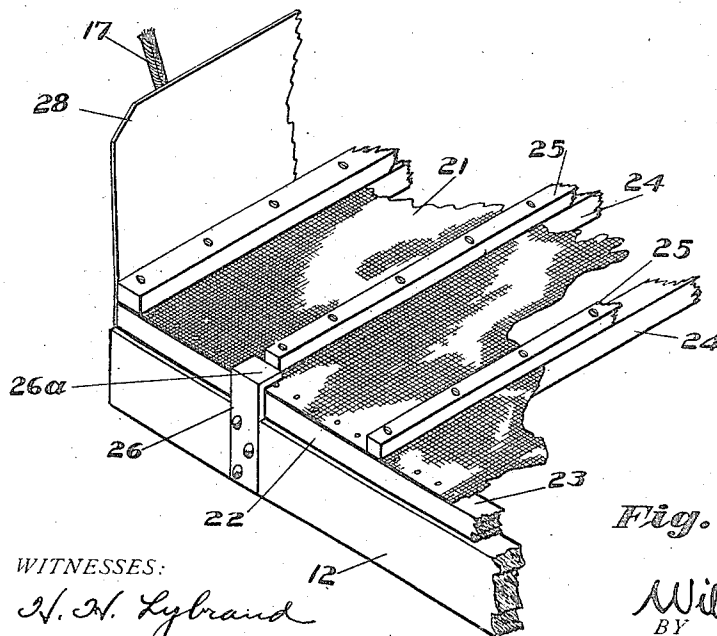


Fig. 4.

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3 SHEETS—SHEET 3.

Fig. 5.

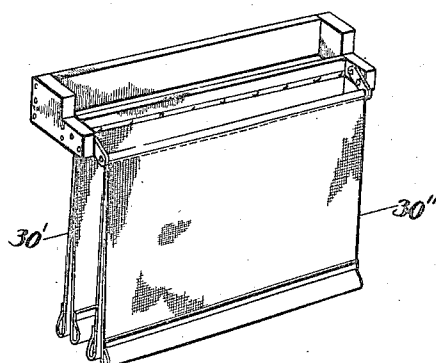
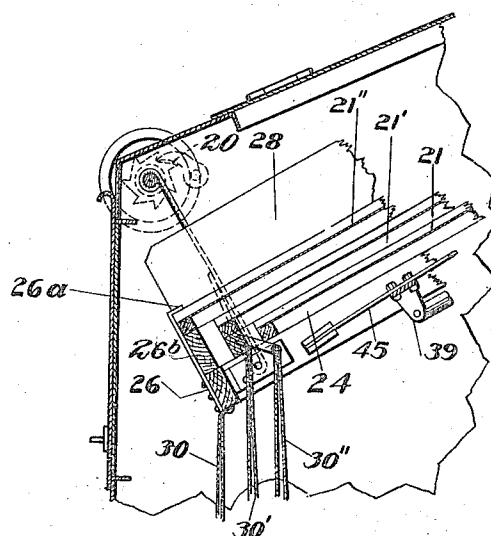


Fig. 6.



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UNITED STATES PATENT OFFICE.

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SCREENING MECHANISM.

1,247,427.

Specification of Letters Patent.

Patented Nov. 20, 1917.

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To all whom it may concern:

Be it known that I, WILLIAM K. LIGGETT, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Screening Mechanisms, of which the following is a specification, reference being had therein to the accompanying drawings.

10 This invention relates to improvements in "hammer" screens. The object is to provide a screen having a screening cloth which is adjustable from one angle of inclination to another and is held bodily stationary, during operation, with means for imparting to the cloth, with great rapidity, intense vibrations of small amplitude.

15 In the accompanying drawings I have shown a mechanism which embodies my invention.

20 Figure 1 is a longitudinal vertical sectional view through the screening apparatus.

Fig. 2 is a plan view of the mechanism illustrated in Fig. 1 with the cover and screening medium removed.

25 Fig. 3 is a fragmentary perspective view of the vibrating mechanism.

Fig. 4 is a fragmentary perspective view of the lower end of the screening element.

30 Fig. 5 is a detail of the spreader used when three screen stretchers are used, to hold the screens in proper working relation.

Fig. 6 is a fragmentary sectional view showing the relation of the three screens to the spreader.

35 Like numerals refer to similar parts in the several figures.

Referring to the drawings, the numeral 1 indicates in general the screen stretcher and its support which, together with the vibrating device comprises the screening mechanism proper. The screens are mounted within a casing provided with suitable doors for easy access to the interior; this casing being supported upon a structural frame work adapted to be secured to a suitable foundation. The casing comprises vertical side plates 2, the front plate 3 with a vertical sliding door 4, the inclined bottom plate 5, the upper back plate 6 in which is an inspection door 6^a and the inclined top 7 provided with two large inspection doors 8. An open section is provided in the bottom of the casing at 9 through which the various grades of material, after screening, fall by

gravity into the chutes or hoppers located below the level of the apparatus. The frame 10 supports the casing upon its foundation 11.

The screening mechanism comprises a rectangular frame 12, supported at its upper end by bearings 13 on the transverse shaft 14, which, in turn, is journaled in bearings 15 attached to the frame 10. The lower end of the frame 12 is provided with outstanding lugs 16 which are engaged by supporting cables 17. These cables 17 are attached for support to a transverse shaft 18 mounted in the front portion of the casing, and provided with a hand wheel 19 by which the shaft may be rotated to wind the cables, and with a ratchet and pawl 20 to prevent unwinding. By the winding and unwinding of the cable 17 the angle of the screening surface may be adjusted to varying conditions of screening.

The screen proper is composed of any suitable material 21, such as bolting cloth or wire mesh, stretched upon a stretcher frame 22 adapted to lie upon the screen frame 12. Attached to the end rails 23 and 23^a of the screen stretcher frame, at spaced intervals across the screen, are intermediate longitudinal rails 24 to which the screen cloth 21 is secured by clamping strips 25. The screen frame 12 is provided at its lower end with upstanding fingers 26 having rearward turned flanges 26^a adapted to engage the top surface of the bottom end rail 23 of the screen stretcher, and at its upper end with similar fingers 27 having forwardly turned flanges 27^a adapted to engage the upper surface of the top end rail 23^a of the screen stretcher. The proportion of the parts is such that the upper end of the screen stretcher may be inserted under the flanges 27^a and pushed far enough back to allow the forward end of said stretcher to drop over the flanges 26^a, after which the stretcher will slide forward to rest against the fingers 26, without becoming disengaged from the flanges 27^a. Side plates 28 serve to hold the stretchers against lateral displacement and at the same time prevent the spilling of material over the sides of the screen. Attached along the lower end of the screen supporting frame 12 are two canvas curtains 30 adapted to hang one on either side of the dividing wall of the chutes or hoppers which may be provided below the machine to re-

ceive the material delivered from the screen, to prevent accidental mixing of the grades.

Fixed to the side rails 31 of the frame 12 are two inward extending studs 32 upon which are pivotally mounted the driving forks 33 and 34, each of which has fingers 35 engaging the eccentrics 36 attached to the shaft 14. The revolution of the shaft, and with it the eccentrics, imparts an oscillatory motion to the driving forks, which motion is transmitted through the connecting rods 37 and 38 to the crank arms 39 and 40 attached to the oscillating hammer bars 41 and 42. The bars 41 and 42, and the parts connected with them, are identical in construction and a description of one of them applies equally to the other. To the bar 41 are bolted trunnions 43 which are journaled for support in suitable apertures of the side rails 31. Secured by suitable clamping straps 44 are a plurality of flat spring bars 45, in spaced relation to each other, corresponding to the spacing of the longitudinal rails 24 of the screen stretcher, and extending an equal distance on each side of the transverse bar 41. The spring bars 45 carry, at each end, hammers composed of weight blocks 46 and fiber striking blocks 47, which are attached in any preferred manner, such as by rivets. The arrangement and proportions of the parts are such that when the bar 41 is oscillated slowly the hammer blocks 47 will not contact with the longitudinal rails 24, but when the speed of oscillation is increased, and the flexibility of the spring bars and the momentum of the weight blocks 46 will cause the blocks 47 to strike the rails 24 sharply, and the concussion of the hammer blows will be transmitted therethrough to the screen cloth, producing vibrations therein, in a direction perpendicular to the surface of the screen. These vibrations, while extremely intense, are of small amplitude and tend to force the fine material through the meshes of the screen without throwing the coarser material away from the screen, allowing it to travel down the screen in very short jumps, thereby being acted upon by a maximum number of vibrations. By this construction the vibrating hammers strike the screen frame a quick blow and immediately rebound from their contact with the rails 24, thereby avoiding any dampening effect upon the vibrations of the screen.

The use of the fiber striking blocks contributes quietness to the operation of the screen without impairing its efficiency. Means for the adjustment of the intensity of the hammer blows is provided in the plurality of the apertures in the driving fork to receive the coupling pins 49 for the attachment of the connecting rods, and the longitudinal screw adjustment of the rods

at 50 provides for the equalization of the striking of the hammers. Suitable means, such as the pulley 51, is provided for the connection of the shaft 14 with a convenient source of power.

The distribution of material to be screened along the upper end of the screening surface may be effected in any preferred manner; but in Fig. 1 I have illustrated one form of feed which is especially advantageous for a screen of the character described. It comprises a flexible plate 52, the rear edge of which is rigidly secured to the lower edge of the feeder casing 53, and which has secured to its lower side, arms 54 adapted to contact with the eccentrics 55 fixed to the shaft 14. As the shaft revolves the plate 52 will be given a vibratory motion which will cause the material resting thereon to flow in an even stream over its forward edge. A vertically adjustable gate 56 regulates the depth of such stream.

It will be noted that the apparatus, as an entirety, is composed of two separable elements. One comprises the screen cloth with its stretcher frame together with the frame upon which are mounted the hammers, their prime power receiving and their power transmitting devices, and also carries the stretcher frame. The other element of the apparatus comprises the main support, including the stationary frame parts, the housing, the power shaft, the feeder and the driver for the feeder. The first element (the screen, its frames and power transmitting devices) can, as a unitary structure, be readily detached from the other element after releasing the bearings 15 from the shaft and the supporting cables 17 from their pins 16. The vibrating fork bars 33, 34 being open at their rear ends sufficiently to permit the forks to be freely passed in either direction over the cams 36 and being attached to the screen frame, do not interfere with readily inserting the screen frame into working position relatively to the shaft and the main support. The entire screen element can be taken out without the detachment of bolts, screws or similar devices after releasing the shaft bearing bolts. At the same time the screen element is free to be adjusted at its lower end vertically so as to vary the inclination of the screen surface as desired without varying the operating relations of the prime driver (the shaft and the cams) to the moving parts on the frame, or varying the relations of the latter parts to the screen cloth. The threaded rods and lock nuts at 50 provide for attaining a very accurate adjustment (in relation to the screen cloth and its stretcher bars) of each of the hammers 47 and of the weights 46, and after such adjustment the throws of the hammers (irrespective of any adjustment

variations in the inclination of the screen cloth) are delicately maintained. As to their two weights 46 provided for the hammers 47 (one for each) on each hammer bar 45, one hammer can be delicately balanced in relation to its mate around the axis of rock of their common bar 45; and the inertia of the weights on one side of said axis assists in attaining the proper movements of the hammers on the other side of the axis. The throw of the driven end of the links 37 can be varied at 49 without affecting the working relations of the fork bars with the shaft, the forks being pivoted directly upon the screen frame, in common with the mountings at 43 for the hammer bars.

The feeder 52, and its driver 54, remain in fixed relations with the shaft, irrespective of the variations in the inclination angle of the screen around the shaft; and consequently the rate of feed is the same unless this rate is varied by its own regulator at 56, which is independent of the angle of the screen, both the feeder and the hammers being driven from a common shaft but independently of each other.

The mounting of the screen stretchers in the manner described makes it possible to easily adapt the machine for grading materials of many different sorts, as one screen stretcher may easily be taken out and another put in. As the screen and its frame are bodily stationary, during operation, that is, are not, as an entirety, subjected to reciprocations, vibrations or oscillations, in any direction, and as the only movements to which they are subjected are those resulting from the taps or blows of the hammers, imparted on lines substantially perpendicular to the plane of the stretcher frame, the latter can be mounted with the above described longitudinal looseness. The screen-stretcher frame bears, at its lower end, snugly against the vertical stops and holders at 26, 26^a, so that it cannot be dislodged by the blows, either vertically or longitudinally; and at its upper end it bears upward against the flanges 27^a of the fingers 27, and is held against displacement upward, in the direction of the blow, although loose to move on lines parallel to the screen, when it is desired to remove a screen or to insert it for another. Such looseness would not be permissible if the screen were itself bodily and rapidly movable in any direction. If desired, two or more screens may be used simultaneously one above the other. In this way a mass of material can be separated into three or more different grades. This is accomplished by the use of the spreader or adapter 26^b, shown in Fig. 5 and Fig. 6, which separates the screening mediums in such a manner that individual troughs or chutes may be provided for the spaces in-

intermediate the screen surfaces without making any alteration in the screening apparatus itself. As shown in Fig. 6 there are three screens 21, 21' and 21''. For keeping separate the materials discharged from these screens respectively there are three curtains 30, 30', and 30''.

What I claim is:

1. The combination of the main support, the normally stationary screen frame, the series of hammers, the vibrating hammer carrying arms mounted on the screen frame, the hammer driving devices mounted on the screen frame, and the power devices on the main support, the inclination of the screen being variable without changing the relations of the hammers to the driving devices.

2. The combination of the main support, the screen, the normally stationary screen frame, the power shaft on the main support, the hammers adapted to impart light blows with great rapidity to the screen, the hammer supporting bars mounted on the screen frame, the hammer driving devices mounted on the screen frame independently of the main support, and the screen being adjustable to different inclinations to the horizontal while remaining in the same operative relationships to the hammers and the hammer actuating devices.

3. The combination of the main support, the power shaft thereon, the hammer driving device on the shaft, and the screen mechanism, comprising the screen, the normally stationary screen frame, the hammers, the hammer supporting parts and the hammer actuating parts all mounted on the screen frame detachably connected to the support in operative relation with the power shaft as set forth.

4. The combination of the main support, the screen, the normally stationary screen frame, the shaft on the support, the hammers, the hammer bars pivotally mounted on the screen frame, the swinging bars carrying open forks and pivoted to the screen frame, the extensible links, the swinging bars adjustably connected to the links, and the cam on the shaft detachably connected with the open forks.

5. The combination of the main support, the shaft, the inclined screen, the normally stationary screen frame detachably mounted at one end on the shaft and at the other on the main support, and the hammer supporting and actuating devices mounted on the screen frame, the hammer actuating devices being separably connected to driving devices on the shaft.

6. The combination of the main support, the casing, the normally stationary inclined screen frame, the stretcher frame resting on the screen frame, the hammers mounted on the screen frame independently of the cas-

ing, means at the upper end of the screen
frame engaging with, and permitting longi-
tudinal movement of, the stretcher frame,
but holding the latter rigidly against move-
5 ment on lines transverse to the plane of the
screen, and means for holding the lower
end of the stretcher frame fixed relatively
to the screen frame, the screen frame,
stretcher frame and the hammers being sep-

arable together from the casing and from 10
the main support.

In testimony whereof, I affix my signa-
ture, in presence of two witnesses:

WILLIAM K. LIGGETT.

Witnesses:

ROBERT A. CURRIE, Jr.,
DUDLEY T. FISHER.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents
Washington, D. C."