May 23, 1939. T. G. CECKA 2,159,549

SIFTER

Filed June 25, 1936 3 Sheets-Sheet 1

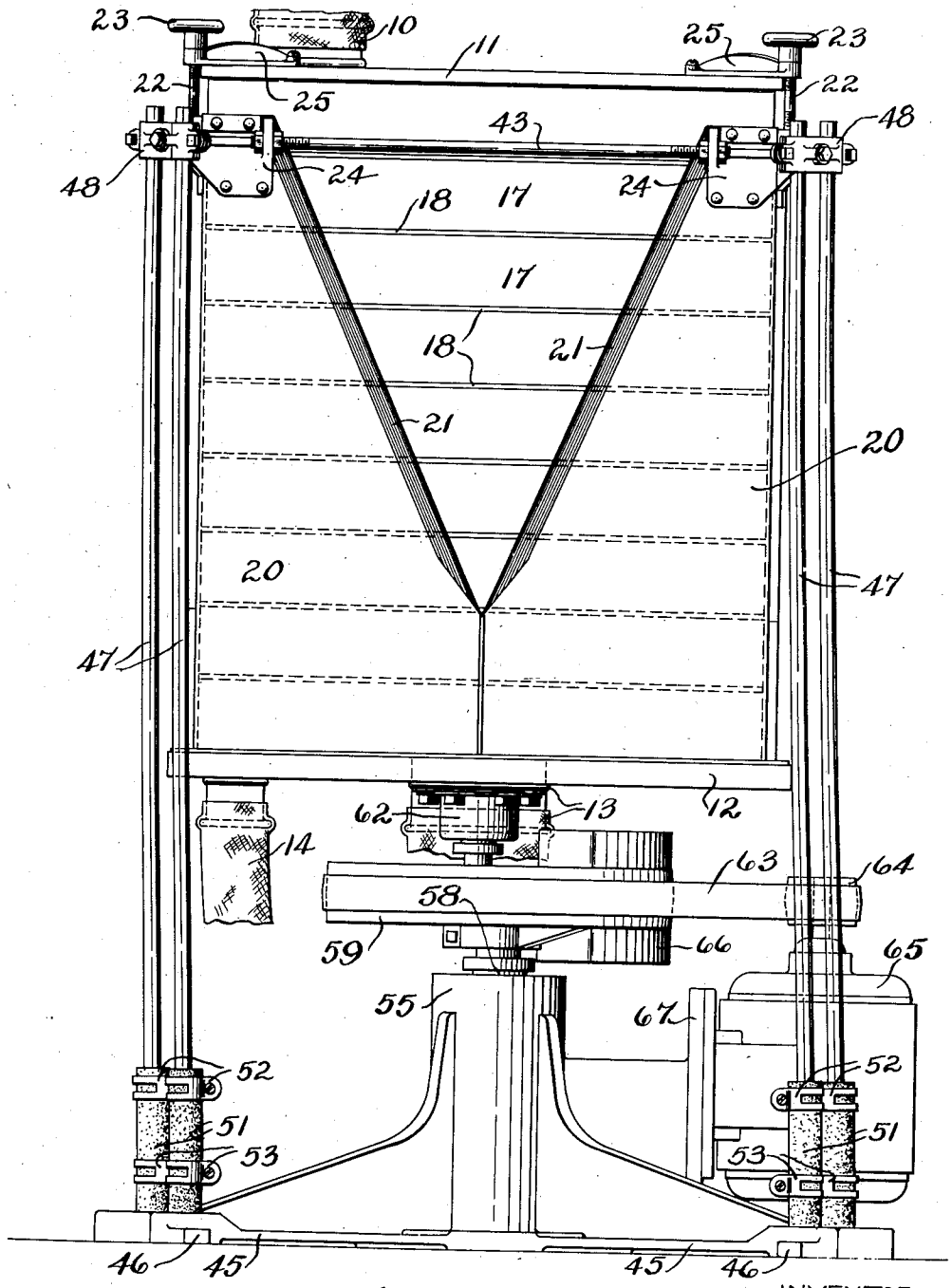


Fig. 1.

INVENTOR
Thomas G. Cecka

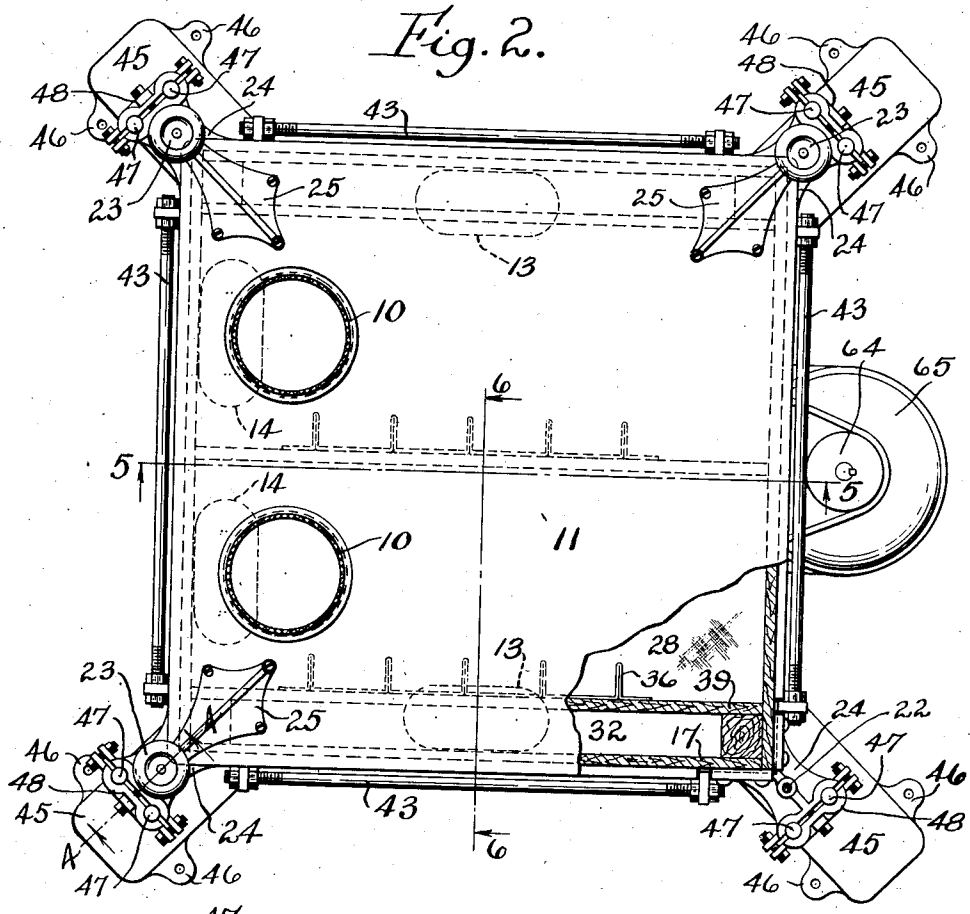
Parker, Prochnow & Farmer
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May 23, 1939. T. G. CECKA 2,159,549

SIFTER

Filed June 25, 1936 3 Sheets-Sheet 2

Fig. 2.



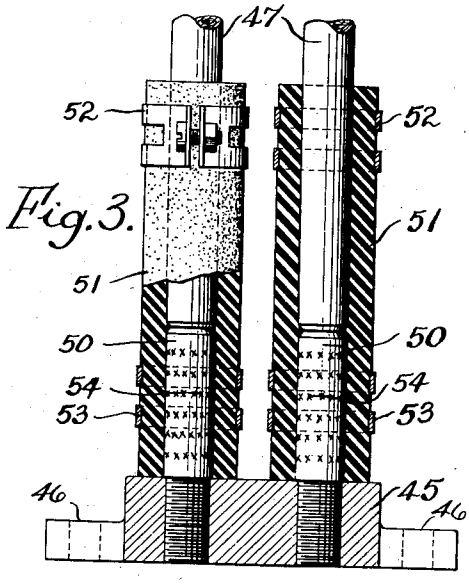


Fig. 3.

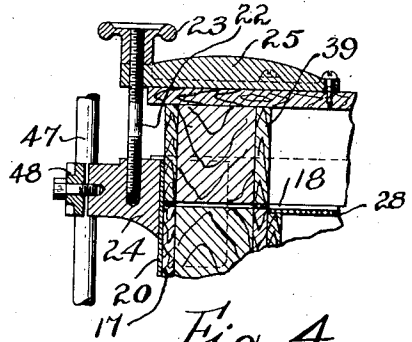


Fig. 4.

INVENTOR

Thomas G. Cecka

Parker, Prochnow & Farmer

ATTORNEYS

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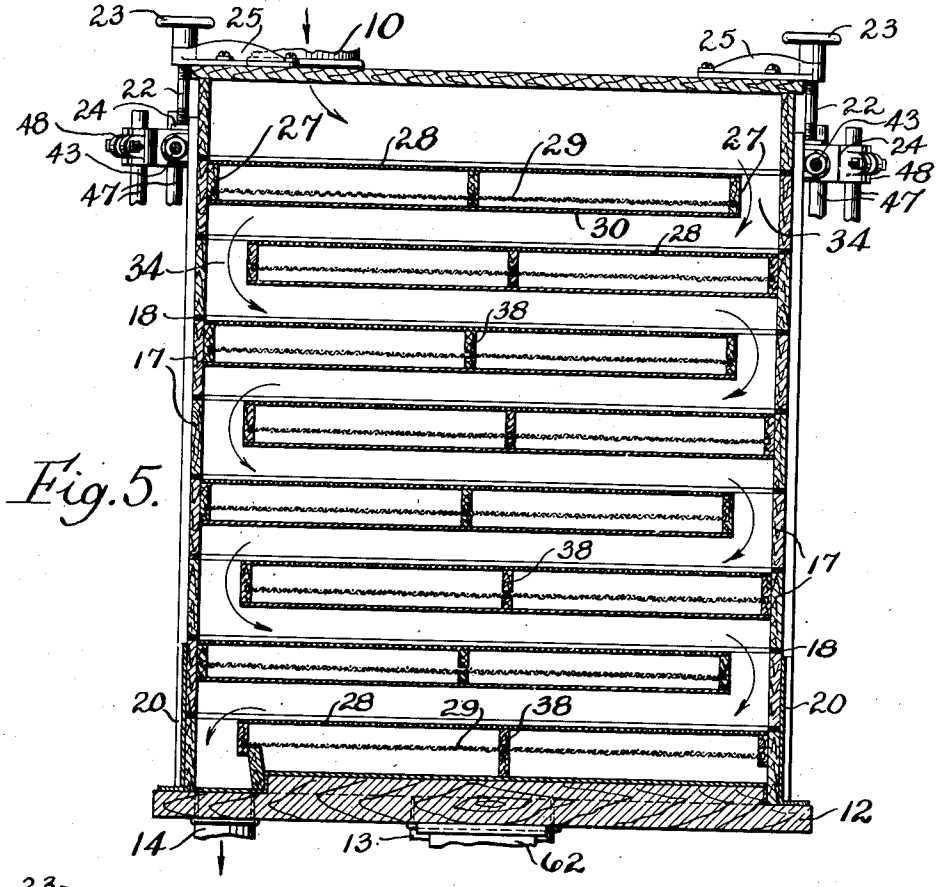


Fig. 5.

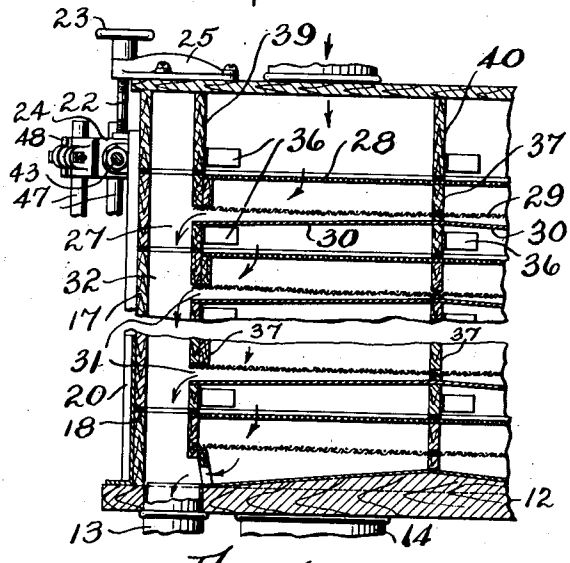


Fig. 6.

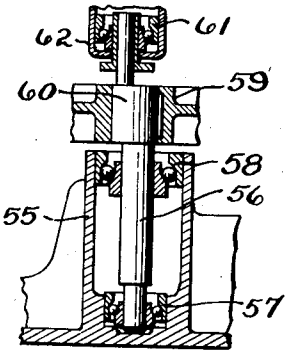


Fig. 7.

INVENTOR
Thomas G. Cecka

Parker, Prochnow & Farmer
ATTORNEYS

Patented May 23, 1939 2,159,549

UNITED STATES PATENT OFFICE

2,159,549

SIFTER

Thomas G. Cecka, Buffalo, N. Y., assignor to International Milling Company, Buffalo, N. Y.

Application June 25, 1936, Serial No. 87,198

17 Claims. (Cl. 209—325)

This invention relates to improvements in sifters.

One of the objects of this invention is to improve the construction of sifters to increase the capacity and efficiency thereof. Another object is to greatly increase the capacity and efficiency of sifters by operating the same at a speed of approximately 300 revolutions per minute in a closed loop path having a substantial radius not materially exceeding one inch. It is also an object of this invention to greatly increase the capacity of sifters by operating the same at a materially higher speed and smaller radius of throw than was heretofore done. Another object of the invention is to provide a sifter in which the sieve or screen is given a rotary motion in a direction approximately parallel to its surface, and also a motion approximately at a right angle to said surface. Another object is to provide a sifter in which the sieve or screen has imparted to it a circular motion, and in which the screen or sieve is yieldingly or flexibly supported to permit the same to move in a direction at an angle to the plane of the circular motion.

Another object of this invention is to provide the sieve or screen of a sifter with a rapid motion in a plane approximately parallel to its base to provide for a movement of the material to be sifted across the surface of the sieve, and also to provide the sieve with a motion toward and from the material to be sifted to produce a motion of the material toward and from the surface of the sieve. Another object of the invention is to provide an improved flexible mounting for a sifter housing from a base or support below the housing.

Still another object of this invention is to provide a sifter which may be of relatively small size, and in which the sieves may be supported from the base of the machine and provided with movements approximately in the plane of the sieve and at an angle thereto. Another object of this invention is to provide a resilient support for a sieve of a sifter to permit movement of the sieve in a direction lengthwise of the support.

A further object of this invention is to provide a sifter which is so formed that a plurality of different materials or grades of materials, can be simultaneously sifted without mixing or intermingling of the materials or grades.

Other objects of this invention will appear from the following description and claims.

In the accompanying drawings:

Fig. 1 is a side elevation of a sifter embodying this invention.

Fig. 2 is a top plan view thereof, partly in section.

Fig. 3 is an elevation, partly in section on an enlarged scale, of the elastic or resilient means for mounting the sifter on a base or other support.

Fig. 4 is a fragmentary section of the sifter, on line 4—4, Fig. 2, on an enlarged scale.

Fig. 5 is a sectional elevation of the sifter housing, on line 5—5, Fig. 2.

Fig. 6 is a fragmentary sectional elevation thereof, on line 6—6, Fig. 2.

Fig. 7 is a fragmentary sectional elevation of the means for transmitting rotary motion to the sifter housing.

The word "sifter" as herein employed is intended to indicate an apparatus for sifting, screening or bolting flour or other finely divided or granular materials for separating the same according to their particle sizes. The sifter shown in the accompanying drawings illustrates by way of example one embodiment of my invention and it is not intended to limit this invention to the particular construction or form of sifter shown in the drawings.

My improved sifter may operate in connection with sieves or screens of any suitable or desired construction and any desired number of such sieves may be employed. The sieves may be all of the same mesh and arranged as shown to separate the material into two grades, or they may be of increasing mesh sizes so as to separate the material into three or more grades of particle sizes. In the construction shown in the drawings, a group of sieves is provided to which the material to be sifted may be supplied through a pair of flexible tubes or ducts 10 extending through the cover or top 11 of the sieve housing. The sieve housing is provided at opposite sides with discharge tubes or ducts 13 for the fine material passing through the sieves, and 14 represents similar tubes or ducts for the discharge of the overs or tailings which have not passed through the sieves, these ducts in the construction shown being connected with a bottom member 12 of the sieve housing.

The sieve housing contains one or more sieves upon the upper face of which the material to be sifted is deposited, and these sieves may be mounted within the sieve housing in any suitable or desired manner. In the particular construction illustrated, the sieve housing is formed of a number of sieve frames 17, each of which has an imperforate outer wall, the walls of the several sieve frames being connected by dust-tight

gaskets 18 of any suitable material, such for example as mohair. The several sieve frames may be held in correct relation to each other in any suitable or desired manner to form the dust-tight side walls of the sieve housing. For example, the bottom 12 of the sieve housing may be provided with an upwardly extending case or frame member 20, formed to engage at least the corner portions of the sieve frames 17 and to hold the same in proper relation to each other. This case or frame member as shown is made of sheet metal and has V-shaped openings 21 at opposite sides thereof to facilitate access to the sieve frames 17 for positioning them within or removing them from the case or frame 20. When the desired number of sieve frames 17 have been placed or positioned within the case or frame 20, the cover or top 11 is placed on the uppermost sieve frame 17 and downward pressure is applied thereto to press the sieve frames into their operative positions. This may be done by means of clamping bolts 22 and nuts 23, the clamping bolts 22 being secured at their lower ends to suitable outwardly extending brackets 24 secured at the upper corner portions of the frame or case 20. The bolts 22 extending through brackets 25 secured to the cover or top 11 and extending beyond the corner portions thereof, the nuts 23 engaging the upper faces of the corner brackets 25 to press the cover or top 11 downwardly against the upper sieve frame 17 and thus press all of the sieve frames into dust-tight relation to each other.

The sieve frames 17 may be constructed in any suitable or desired manner, and as shown each sieve frame is provided with an inner sieve supporting frame 27 to the upper edges of which a screen or sieve 28 of any suitable material is secured. The inner sieve supporting frame 27 has three sides thereof spaced from the outer sieve frame 17, while at the fourth side, the inner frame 27 is secured directly to the outer frame 17. Below the sieve 28 is provided the usual coarse wire screen 29 upon which the usual cleaning brush (not shown) may be supported which moves along the undersurface of the sieve 28 and prevents plugging of the meshes of the sieve. Below the coarse wire mesh screen 29 is provided an imperforate deflector plate or tray 30, that shown in the accompanying drawings, see particularly Fig. 6, inclining downwardly from the longitudinal center of the sieve frame 27 toward opposite sides thereof and terminating at its sides in slots 31 formed in opposite sides of the inner screen frame 27. These slots terminate in the spaces 32 arranged at opposite sides of the screen frames between the outer frames 17 and the inner frames 27. Since these spaces 32 of successive sieve frames 17 are arranged in vertical alinement, the material which has passed through the sieves 28 and on the trays 30 will drop through the alined spaces 32 to the bottom 12 of the sieve housing and will pass out of the sifter through the tubes or ducts 13, see particularly Fig. 6. The material which does not pass through a sieve 28 is rapidly passed by the movement of the sifter housing to the end of the sieve 28 and drops beyond the end of the inner frame member 27 through a space 34 between the inner and outer sieve frames 27 and 17 upon one end of the next lower sieve 28, from which material is discharged at the opposite end thereof through another passage 34 leading to the next lower sieve 28. Similarly material continues to pass in cascade fashion through the sieve housing until finally the material which has not passed through any of the sieves 28 is discharged from the sifter through the flexible tubes or ducts 14.

In order to expedite the passage of the material across the sieves 28, particularly when the sieves are arranged horizontally as shown, carrier flights 36 (Fig. 6), which may be in the form of short metal plates are provided above each sieve to deflect the material across the sieve and toward the discharge end thereof during the rotary motion of the sieve housing. In the construction shown, the carrier flights are secured to the sieve frames 27 below the trays, so that when the sieve frames are arranged one above the other, the carrier flights of one sieve frame will be arranged above the sieve 28 of the next lower sieve frame.

In the particular construction shown, each inner sieve frame is provided with longitudinally extending central walls or partitions 37 and transversely extending partitions 38, both of which serve as supports for the sieves 28. The longitudinally extending walls or partitions 37 may be of approximately the height of the outer walls of the sieve frames 17 and are arranged one above the other in vertical alinement to form an imperforate dividing wall in the middle of the sifter, so that each side of the sifter operates substantially independently of the other.

The sifter arrangement described is desirable in that different materials may be simultaneously sifted in the two sides without any mixing of the materials. In my improved sifter, the distance or clearance between a sieve 28 and the imperforate tray 30 of a superimposed sieve frame is made greater than in sifters heretofore made to accommodate the larger quantity of material which my improved sifter is capable of handling and by arranging the trays 30 so as to deflect material toward opposite sides of the sifter, the capacity of the sifter is also increased. The cover or top 11 of the sieve housing is, of course, also provided with suitable downwardly extending walls or partitions 39 to confine the material to be sifted to the top surface of the upper sieve 28 and to prevent the same from passing through the upright ducts or spaces 32 with the fine material which has passed through the sieves 28. A further partition 40 in alinement with the central longitudinal walls or partitions 37, completes the separation of the two halves of the sifter housing.

In the use of the sifter, the sieve frames 17 can, of course, be readily removed by releasing the clamping nuts 23 and these frames 17 can be replaced by other frames having sieves 28 of different meshes, and if a smaller number of sieves is required, sieve frames 17 not provided with sieves 28, screens 29, and trays 30 can be used to fill in the space of the sieves not required, as was customary heretofore in sifters.

43 represents horizontal braces or spacing rods, the ends of which are secured to the corner brackets 24, for reinforcing the upper portion of the sieve housing.

I have found that in the operation of a sifter, a very greatly increased capacity and higher efficiency can be obtained if the housing containing the sieves is flexibly and resiliently, mounted in such a manner that when a circular motion is imparted to the sieve housing, this housing is free to move in other directions than the direction of circular movement imparted to it by a suitable driving mechanism. For example, in connection with the housing which has been described, greatly increased efficiency and capacity of the machine can be obtained if, in addition to imparting a movement in a circular direction to the sieve

housing, this housing is also supported in such a manner that the same may move up and down to a limited extent. In order to carry out this improvement, the sifter housing is preferably supported from beneath the sieve housing, since from a practical standpoint it is more desirable to support the sieve housing from a base arranged below the same, on which base the drive mechanism for imparting circular motion to the housing may also be mounted. I have illustrated my invention, by way of example, by means of a sifter mounted in this manner upon a base which may be of substantially unitary construction and provided with outwardly extending legs **45**. These legs may be provided with suitable apertured lugs **46** by means of which the sifter may be bolted to a floor.

The legs **45** of the base extend below the corners of the sieve housing and are constructed to receive the lower ends of flexible and elastic supports, capable of yielding to permit lateral movement of the sieve housing and also resilient or elastic to permit a limited up and down movement of the sieve housing. Any suitable supports having these properties may be employed. In the particular construction shown, I employ a plurality of flexible rods or reeds **47** of wood, such as have heretofore been used for suspending sifters from overhead supports, but since such reeds have practically no elasticity or resilience, I supplement such reeds with some elastic or resilient means, which may conveniently be provided at either the upper or lower ends thereof. In the construction illustrated, the upper ends of the reeds **47** are suitably secured by clamps **48** to the corner brackets **24** of the case or frame **20** of the sieve housing. The legs **45** are provided with upwardly extending studs **50** secured thereto, and a sleeve **51** of resilient material connects the studs **50** with the lower ends of the reeds **37**. The resilient sleeve may be secured to the studs **50** and the reeds by means of suitable clamps **52** and **53** arranged respectively about the upper and lower portions of the flexible sleeves **51**. These sleeves may be made of rubber, and if desired, they may be reinforced by means of fabric or canvas. Short lengths of steam hose have, for example, been found very satisfactory to form the resilient parts of the supports. The studs **50** may be roughened as indicated by **54** to better secure the sleeves **51** thereto. Because of the flexibility of the sleeves, the relatively short reeds **37** do not break when the machine is in operation, since most of the flexing as well as all of the stretching takes place in the sleeves.

The base of the apparatus may also form a support for the driving connection for the sieve housing. In the particular construction shown, the base is provided with an upwardly extending central part or hollow post **55**, in which a bearing is formed for the lower part of an upright crank or eccentric shaft **56**, suitable ball or roller bearings **57** and **58** being shown for this purpose. The shaft **56** has a drive wheel or pulley **59** secured thereon above the post **55** of the base. The shaft also has an upwardly extending crank or eccentric portion **60** which extends into a self-aligning bearing **61** suitably arranged in a bearing housing **62** secured to the base **12** of the sieve housing. The self-alining bearing **61** may be of any suitable or desired construction and the crank or eccentric **60** has a slidable fit within this bearing, so that the bearing may move up and down relatively to the crank or eccentric **60**.

The pulley or drive wheel **59** may be driven by means of a belt **63** from a pulley **64** of a vertically arranged motor **65** and in order to reduce vibration of the sifter, a counterweight **66** may be provided which is disposed diametrically opposite to the crank or eccentric **60** of the upright drive shaft. The motor **65** in the construction shown is secured to a suitable bracket **67** which may be formed integrally with the base of the sifter. It will, of course, be understood that any other means for imparting circular or horizontal motion to the screen housing may be employed in place of the particular mechanism shown.

In the operation of the sifter described, it has been found that if the crank or eccentric **60** is driven, the sieve housing acquires a movement which results in very greatly increased capacity and high efficiency of the machine, and this is due to the fact that because of rapid circular or horizontal motion imparted to a portion of the sieve housing, this housing moves not only in a horizontal circular direction, but also the housing acquires an up and down motion, which is particularly pronounced at the outer edge portions of the housing. This up and down motion is also restricted or limited by the resilient connectors, so that the upright movement cannot become excessive so as to interfere with the efficient operation of the machine.

It has, for example, been found that if the sifter is built of a size so that the entire surface of each of the sieves **28** is somewhere in the neighborhood of twenty inches square, and if the eccentric or cam **58** has a two inch throw, or, in other words, travels in a circle of about two inches diameter, at approximately 290 to 310 revolutions per minute, the flexible steam hose mountings **51** will stretch about $\frac{1}{8}$ of an inch during each revolution of the driving shaft, thus producing an up and down movement in addition to the circuar movement of the sieve housing. A sifter of these proportions has a capacity of approximately three times that of any sifters now in use per unit of sieve area. This increase in capacity may be due in part to the fact that the sieves receiving vertical movement which probably throws the material on the sieves **28** upwardly off the surface of the sieves, and thus increases the speed with which the fine material passes through the sieves. It has also been found that the coarse material is thrown upwardly to the upper surface of the material upon the sieves, so that this coarse material will not tend to block or plug the meshes in the sieves. It has also been found that a sifter of the size above stated and equipped with ten sieves, requires approximately one-quarter of a horse power to drive it at a speed of 300 revolutions per minute, so that the sifter is extremely efficient and economical in the use of power.

I claim as my invention:

1. A sifter including a base, a sieve housing arranged above said base, power driven mechanism mounted on said base for imparting movement in a circular direction to the lower portion of said housing, flexible rods extending upwardly from said base and secured to the upper portion of said housing, and a resilient sleeve connecting said base and each of said rods and permitting said rods to move toward and from said base.

2. A sifter including a base, a sieve housing arranged above said base, mechanism mounted on said base for imparting movement to said housing, including a shaft journalled in said base and having a crank portion, a self-alining bear-

ing secured to the bottom of said housing and into which said crank portion of said shaft extends, means for rotating said shaft, flexible rods having their upper ends secured to the upper portion of said housing, and elastic sleeves each of which has one end secured to said base and the other end secured to the lower portion of a rod.

3. A sifter having a sieve housing containing a sieve upon which material to be sifted is deposited, means for imparting rotary motion in a substantially horizontal plane to the lower portion only of said sieve housing at a speed of approximately 300 revolutions per minute and on a radius of approximately one inch, and means for yieldingly supporting said housing to permit circular motion thereof and also movement in an up and down direction.

4. A sifter having a sieve housing containing a sieve upon which material to be sifted is deposited, means for imparting rotary motion in a substantially horizontal plane to the lower portion only of said sieve housing at speed of approximately 300 revolutions per minute and on a radius of approximately one inch, a fixed base above which said housing is arranged, and means extending upwardly from said fixed base for supporting said housing, the upper portion of said supporting means being movable in a circular direction, said supporting means also being resilient to permit slight vertical movement of said housing.

5. A sifter having a sieve housing containing a sieve upon which material to be sifted is deposited, means for imparting rotary motion in a substantially horizontal plane to the lower portion only of said sieve housing at a speed of approximately 300 revolutions per minute and on a radius of approximately one inch, a base above which said housing is arranged, reeds extending upwardly from said base and secured to said base and to said housing, the upper portions of said reeds being movable in approximately horizontal circular paths.

6. A support for a sifter housing including a slender flexible rod forming a connection between a supporting structure and a sifter housing, and a resilient member having a part thereof secured to said supporting structure and another part secured to one end of said rod, and forming the sole connection between said rod and said supporting structure, to permit said support to yield in the direction of its length, said resilient member also flexing to enable said rod to swing relatively to said supporting structure.

7. A support for a sifter housing, including a slender flexible rod forming a connection between a supporting structure and the housing and having an elastic sleeve into one end of which an end of said rod extends, the other end of said sleeve being secured to said supporting structure, said sleeve forming the sole connection between said rod and said supporting structure.

8. A method of sifting material which comprises placing upon the upper surface of a sieve the material to be sifted, imparting to the sieve motion in a substantially horizontal direction and in a circular path of approximately one inch radius and at a speed of about 300 R. P. M., and also moving said sieve to a limited extent in an up and down direction during each of said revolutions.

9. A sieve including a frame having screening material secured thereto in a position to support the material to be sifted on the upper face thereof, a plurality of short plates extending above said screening material and in close proximity thereto for advancing the material to be sifted across said screening material during movement of the sieve, a coarse mesh screen arranged below and substantially parallel to said screening material for supporting a cleaning member for engaging the underneath surface of said screening material for cleaning the same, and means for imparting movement to said sieve in a substantially circular path approaching but not materially more than about one inch radius at a speed of about 300 revolutions per minute.

10. A method of sifting material which comprises placing upon the upper surface of a sieve the material to be sifted, and imparting to the sieve motion in a substantially horizontal direction and in a closed loop path of a width approaching but not materially more than about two inches across and at a speed of about 300 R. P. M.

11. A method of sifting material which comprises placing upon the upper surface of a sieve the material to be sifted, and imparting to the sieve motion in a substantially horizontal direction and in an approximately circular path of about one inch radius and at a speed of approximately 290 R. P. M. to 310 R. P. M.

12. A sifter having a sieve disposed to receive and support a material to be sifted and to sift said material upon approximately horizontal lateral movement of the sieve, means yieldingly supporting said sieve for such lateral sifting movement in an endless, looped path approaching, but not materially more than, about two inches throw, and means for moving said sieve through said path at a speed in the range from about 290 R. P. M. to about 310 R. P. M.

13. In the sifting of material deposited on an approximately horizontally and laterally moving sieve that is disposed to receive, support and sift material deposited thereon, that improvement in the method of operation thereof which comprises moving said sieve laterally in an endless, looped path approaching but not materially exceeding two inches across, and at a speed in the range of approximately 290 R. P. M. to 310 R. P. M.

14. In the sifting of material deposited on a laterally and approximately horizontally moving sieve that is disposed to receive, support and sift material deposited thereon, and that has carrier flights arranged above the upper face thereof along a side thereof, that improvement in the method of operation thereof which comprises moving said sieve laterally in an endless, looped path of about two inches across, at a speed in the range of approximately 290 R. P. M. to 310 R. P. M.

15. A sifter having a sieve housing containing a sieve upon which material to be sifted is deposited, means for yieldingly supporting said sieve for approximately horizontal movement in an approximately circular path, means for imparting to said sieve, in a substantially horizontal plane, motion in said approximately circular path approaching, but not materially greater than, approximately two inches across, and means for driving said motion imparting means at a speed in the range of approximately 290 R. P. M. to 310 R. P. M.

16. A sifter having a sieve housing containing a sieve upon which material to be sifted is deposited, means for yieldingly supporting said sieve for movement in a substantially circular path, means for imparting to said sieve motion in said circular path of about one inch radius

in a plane approximately parallel to said sieve, and means for driving said motion imparting means at a speed in the range of approximately 300 R. P. M.

17. A sifter having a sieve housing containing a sieve upon which material to be sifted is deposited, and which is located intermediate of the upper and lower ends of said housing, means for imparting motion in a substantially horizontal plane to said sieve housing at a speed of approximately 300 R. P. M., and in a closed loop path of a radius approaching but not materially exceeding one inch, and means for supporting said housing to permit both rotary motion thereof and a limited movement in an up and down direction.

THOMAS G. CECKA.