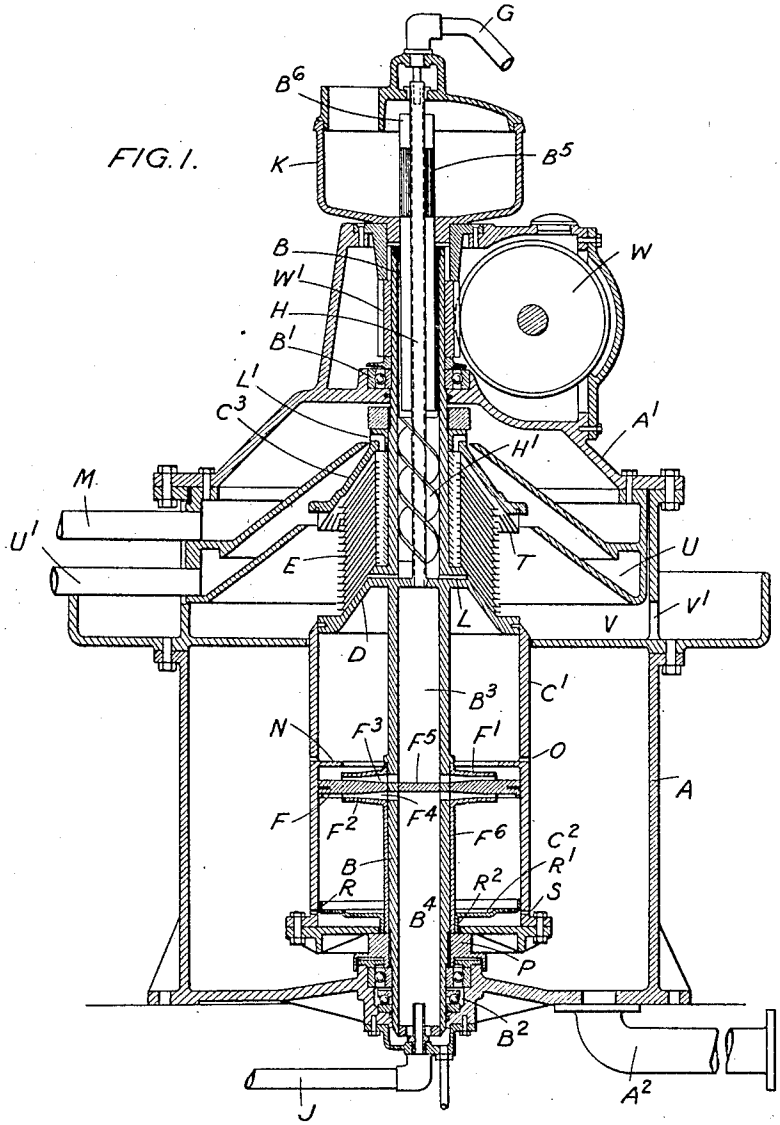
Nov. 8, 1927. 1,648,790

R. A. STURGEON

CENTRIFUGAL SEPARATING APPARATUS

Filed Sept. 24 1926 2 Sheets-Sheet 1

FIG. 1.



INVENTOR
R. A. STURGEON
T. A. Blair
J. A. McGoyne
ATTYS.

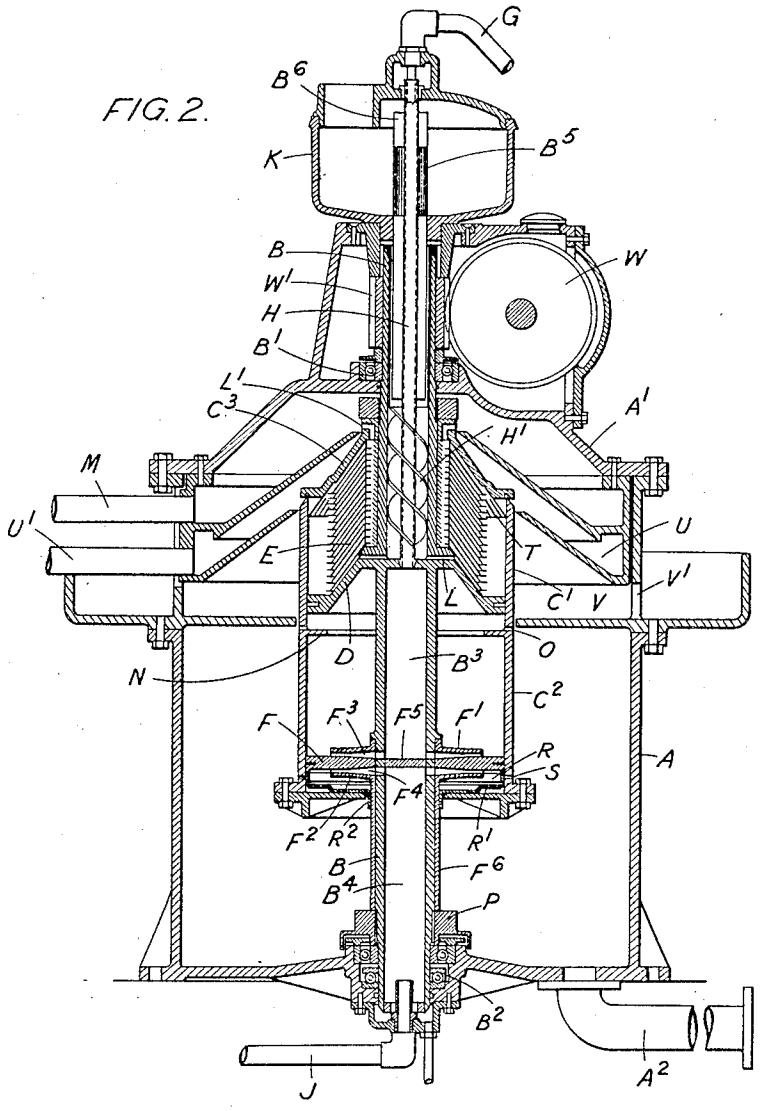
Nov. 8, 1927. 1,648,790

R. A. STURGEON

CENTRIFUGAL SEPARATING APPARATUS

Filed Sept. 24 1926 2 Sheets-Sheet 2

FIG. 2.



INVENTOR
R.A. STURGEON

ATTYS.

Patented Nov. 8, 1927. 1,648,790

UNITED STATES PATENT OFFICE.

ROBERT ALEXANDER STURGEON, OF BRIGHOUSE, ENGLAND.

CENTRIFUGAL SEPARATING APPARATUS.

Application filed September 24, 1926, Serial No. 137,597, and in Great Britain October 1, 1925.

This invention relates to centrifugal separating apparatus of the kind in which the solid particles are intermittently discharged without stopping the rotation of the machine, and has for its object to provide an improved form of such apparatus in which the liquid is subjected to an additional centrifuging before leaving the machine.

The centrifugal separating apparatus comprises a nest of cones mounted to rotate within a separating cylinder and an operating cylinder mounted to rotate together with the cones. The operating cylinder contains a piston and means are provided for admitting liquid to each side of the piston in turn so as to produce relative axial movement between the piston and cylinder, the centrifugal pressure of the liquid so admitted causing such relative axial movement and this movement being utilized to control the discharge opening for the separated solids.

Preferably the separating and operating cylinders are combined into a single cylindrical casing mounted concentrically with a hollow shaft through which is admitted the liquid to be treated and to this shaft is secured a piston, which divides the casing into two parts, one of which constitutes the separating cylinder and the other the operating cylinder. Within the upper part or separating cylinder is disposed the nest of cones secured to the shaft and within the lower part or operating cylinder an axially fixed piston is provided. Normally the upper end of the casing bears against a cover secured to the shaft so as to make a fluid tight joint. Means are provided for admitting liquid to each side of the lower piston in turn, the centrifugal pressure of the liquid so admitted serving to raise or lower the casing as a whole. When the casing is lowered, the joint between its upper end and the fixed cover is broken and the separated solid matter is discharged, the feed of liquid to be treated being at the same time suspended. After the solid matter has been discharged the casing is raised again and the feed of liquid is restarted.

The invention may be carried out in various ways but one construction according thereto is illustrated in the accompanying drawing, in which

Figure 1 shows the apparatus in sectional elevation with the cylinders in the lowermost position, and

Figure 2 is a view similar to Figure 1 with the cylinders in the raised position.

In the construction illustrated in the drawing the apparatus comprises an external casing A provided with a cover A^1 through which projects a rotatable hollow shaft B mounted in ball bearings B^1, B^2. Within the casing A and mounted so as to be axially movable on the shaft B is an inner cylindrical casing divided into two parts C^1, C^2 by a piston D secured to the shaft and having an axially fixed cover C^3. Within the part C^1 of the casing is disposed a nest of cones E which together with the upper part C^1 of the casing forms the separator. A second piston F is secured to the shaft inside the lower part C^2 of the casing and two flanges F^1 and F^2 are provided on the shaft immediately above and below the piston respectively so as to form two channels F^3 and F^4. A baffle plate F^5 is also provided in the plane of the piston F in order to prevent the passage of liquid past this point.

At the upper end of the apparatus is a pipe G connected to a second pipe H mounted within the shaft B so as to rotate therewith and communicating at its lower end with the space B^3 between the piston D and the baffle F^5. The pipe H is also provided at its lower end with helical vanes H^1. At the bottom of the hollow shaft B is a pipe J opening into the space B^4 below the baffle F^5.

The liquid to be treated is fed into a tank K at the top of the apparatus and passes into the hollow shaft through the filter B^5 and feed pipe B^6. It is taken up by the helical vanes H^1 and enters the separating cylinder C^1, through the passages L. The solid matter is thrown by centrifugal force against the wall of the cylinder C^1 and remains there while the liquid passes through the cones E and is discharged at L^1 into the outlet conduit M.

Within the operating cylinder C^2 and above the piston F is an internal radially projecting baffle N, and above this baffle is an exhaust port O. The piston F is maintained in position by means of a sleeve extension F^6 which engages with a screwed collar P, and immediately below the piston F is an expansible valve ring R which serves to control ports S in the walls of the cylinder C^2. Be-

low the valve ring R is a circular plate or disc R^1 provided with a sleeve extension R^2 adapted to slide on the sleeve F^6 of the piston F.

In operation the machine is started up with the cylinders C^1 and C^2 in their lowermost position (Figure 1), resting on the screwed collar P. When the proper running speed is attained, water is admitted through the pipe G into the hollow shaft B and passes down the pipe H into space B^3 between the piston F and the baffle N. Thence it passes into the cylinder C^2 through the channels F^3. As the cylinder fills up, the centrifugal pressure of the water acting upwards on the baffle N and downwards on the piston F raises the casing C^1, C^2 into the position shown in Figure 2 until its upper edge makes contact with the cover C^3. The upper part C^1 of the casing forming the separator is thereby closed and the water entering through the pipe H is then turned off. The liquid to be treated is then fed into the tank K and passes through the filter B^5 and feed pipe B^6 into the hollow shaft B. It is taken up by the vanes H^1 and enters the separating cylinder C^1 through the passages L as already described. The separated solids adhere to the walls of the cylinder C^1 and the liquid passes out through the passages L^1 into the conduit M. When the centrifuging process has been carried out to the desired extent the feed of liquid to be treated is cut off and water is admitted to the underside of the piston F through the pipe J. This water passes up through the space B^4 within the hollow shaft B below the baffle F^5 and enters the cylinder C^2 through the channels F^4. As soon as the radial depth of the water below the piston F exceeds that of the water above the piston the casing C^1, C^2 begins to descend. As it does so the water above the piston F is forced out through the discharge port O. The casing in descending carries with it the valve ring R until the latter is arrested owing to the sleeve R^2 coming into contact with the screwed collar P. The casing now continues to descend leaving the ring R behind, and the movement of the ring relatively to the casing uncovers the ports S in the walls of the latter and allows the water to escape (see Figure 1). The downward movement of the casing C^1, C^2 breaks the contact between its upper edge and the cover C^3 and the surface liquid in the separating cylinder is allowed to escape through slots T into a trough U whence it is passed through a pipe U^1 for retreatment. As the casing continues to descend it leaves the solid matter unsupported so that it is discharged by centrifugal force into a chamber V from which it is collected through openings V^1. When the casing has reached its lowermost position all the solids have been discharged and the water supplied through the pipe J is cut off. Water is then again admitted through the pipe G and the casing rises as before until it again makes tight the joint between its upper edge and the cover C^3. During the last part of the upward movement of the casing the valve ring R comes into contact with the piston F and is moved back into its former position so that it again covers the ports S (Figure 2). The supply of water through the pipe G is then cut off and the machine is ready to receive another charge of liquid to be treated. The water discharged from the operating cylinder C^2 through the ports O and S is collected in the outer casing A and removed through a pipe A^2.

The motive power is supplied to the machine through gears W, W^1 and drives the apparatus continuously, the cycle of operations being repeated indefinitely without stopping the rotation of the machine.

Means, not forming any part of the present invention, are provided for supplying water to each side of the operating piston F in turn, such means being actuated by the axial movement of the casing C^1, C^2.

What I claim as my invention and desire to secure by Letters Patent is:—

1. In centrifugal separating apparatus the combination of a separating cylinder, a nest of cones mounted to rotate within the separating cylinder, an operating cylinder mounted to rotate together with the cones, a piston disposed within the operating cylinder, said piston and cylinder being capable of relative axial movement, means for admitting liquid to each side of the piston in turn and means whereby the relative axial movement of the operating cylinder and the piston due to the centrifugal pressure of the liquid so admitted controls the discharge opening for the separated solids.

2. In centrifugal separating apparatus the combination of a separating cylinder, a nest of cones mounted to rotate within the separating cylinder, an operating cylinder mounted to rotate together with the cones, a piston disposed within the operating cylinder, said piston and cylinder being capable of relative axial movement, means for admitting liquid to each side of the piston in turn and an operative connection between the operating cylinder and the separating cylinder such that the relative axial movement of the operating cylinder and the piston due to the centrifugal pressure of the liquid admitted thereto causes the separating cylinder to move relatively to the cones so as to control the discharge opening for the separated solids.

3. In centrifugal separating apparatus the combination of a hollow shaft, a cylindrical casing axially movable relatively to the hollow shaft, a piston rigidly secured to the hollow shaft so as to divide the casing into two

parts, a nest of cones mounted on the hollow shaft within the upper portion of the casing, a cover secured to the hollow shaft above the cones against which the top of the casing normally bears to form a fluid-tight separating chamber, a second piston secured to the hollow shaft within the lower part of the casing, means for admitting liquid to each side of the lower piston in turn and means whereby the centrifugal pressure of the liquid so admitted causes the casing to move so as to make and break alternately the joint between the casing and its cover in order to permit an intermittent discharge of the separated solids.

4. In centrifugal separating apparatus the combination of a separating cylinder, a nest of cones mounted to rotate within the separating cylinder, an axially movable operating cylinder mounted to rotate together with the cones, an axially fixed piston disposed within the operating cylinder, means for admitting liquid to each side of the piston in turn, an operative connection between the operating cylinder and the separating cylinder such that the movement of the operating cylinder due to the centrifugal pressure of the liquid admitted thereto causes the separating cylinder to move relatively to the cones so as to control the discharge opening for the separated solids and a valve ring disposed within the operating cylinder and operated by the movement of said cylinder to control a discharge opening for the water within the operating cylinder.

5. In centrifugal separating apparatus the combination of a rotatable hollow shaft, a cylindrical casing axially movable relatively to the hollow shaft, a piston rigidly secured to the hollow shaft so as to divide the casing into two parts an upper separating cylinder and a lower operating cylinder, a nest of cones mounted on the hollow shaft within the separating cylinder, a cover secured to the hollow shaft above the cones against which the top of the casing normally bears to form a fluid-tight separating chamber, a second piston secured to the hollow shaft within the operating cylinder, means for admitting liquid to each side of the lower piston in turn, a discharge valve for the liquid below the piston operated by the axial movement of the casing due to the centrifugal pressure of the liquid, a radial baffle projecting into the space above the lower piston and against which the centrifugal pressure of the liquid acts to lower the casing and an opening above the baffle through which the liquid above the piston is discharged during the downward movement of the casing.

In testimony whereof I have signed my name to this specification.

ROBERT ALEXANDER STURGEON.