Dec. 28, 1954 C. H. SLEEMAN 2,698,089

ORE TESTING SYSTEM

Filed June 24, 1949 2 Sheets-Sheet 1

Fig. 1.

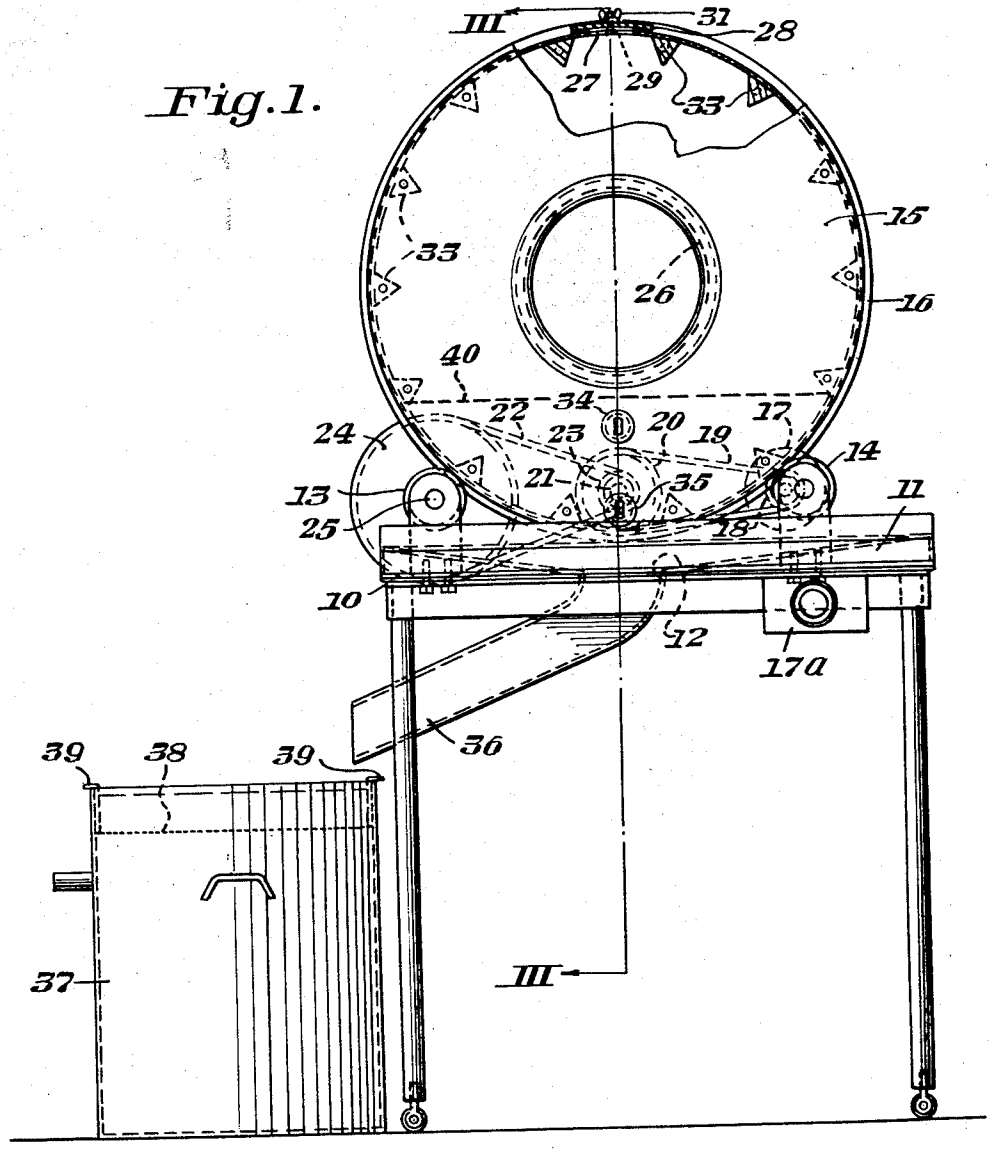
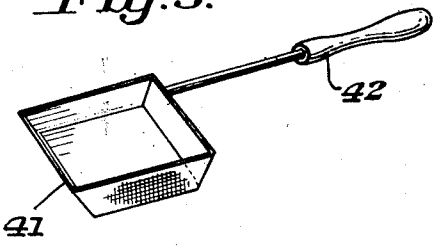



Fig. 5.




INVENTOR
Clarence H. Sleeman
By his attorneys
Hoopes, Leonard & Glenn

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Filed June 24, 1949 2 Sheets-Sheet 2

Fig. 2.

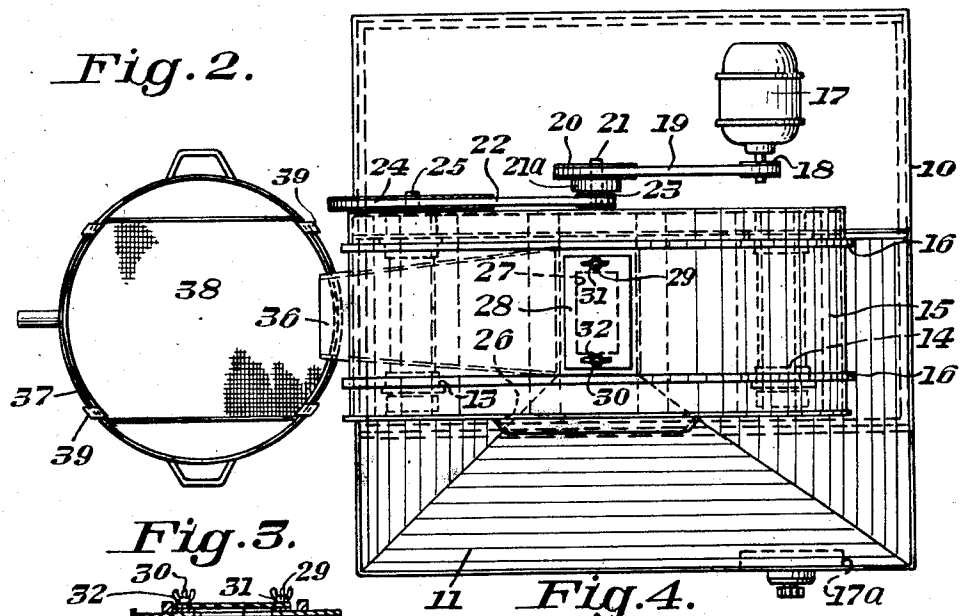



Fig. 3.

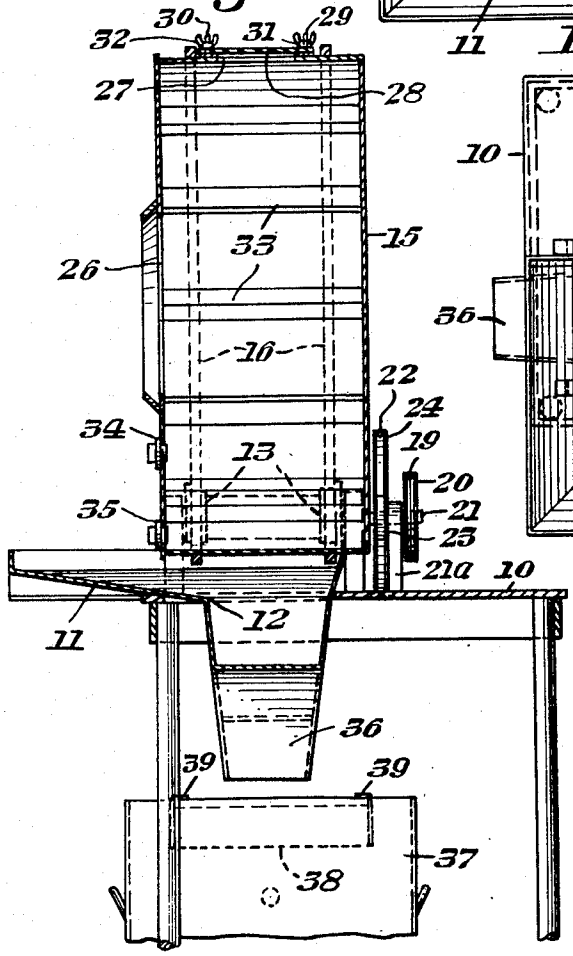
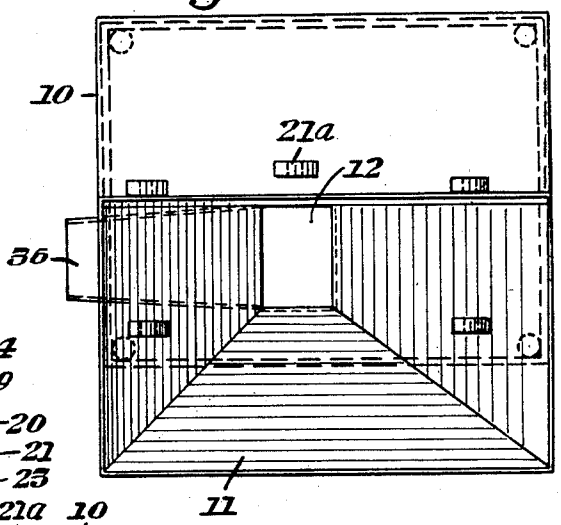



Fig. 4.




INVENTOR
Clarence H. Sleeman
By his attorneys
Hoopes, Leonard & Gleem

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# ORE TESTING SYSTEM

Clarence H. Sleeman, Calumet, Minn., assignor to Inter-State Iron Company, Virginia, Minn., a corporation of Minnesota

Application June 24, 1949, Serial No. 101,021

8 Claims. (Cl. 209—172.5)

This invention relates to apparatus and method of testing ore, particularly for testing on a laboratory scale the content of heavy density ore in small coarse samples of crude ore.

In order to test a sample of crude ore the sample is introduced into a fluid medium containing a suspension of extremely fine particles having a specific gravity between that of the heavy density ore and the impurities associated therewith. The resultant mixture is then agitated so that the impurities float to the top of the mixture while the heavy density ore sinks to the bottom of the mixture. After the separation of the heavy ore from the lighter impurities has been substantially completed by the continued agitation of the mixture, the ore and the impurities are separately removed from the mixture and the ore is weighed to determine the amount of the heavy density ore in the sample under test.

It is the ultimate purpose of my invention to provide the most effective and simple apparatus and procedure for carrying out this test. My apparatus is devised for use on a laboratory scale and my method of testing saves a great deal of time as compared with the standard so-called "bucket test," which calls for pouring a mixture of water, ferro-silicon and the crude ore sample into a bucket and manually stirring the mixture with a wooden paddle while periodically screening off the floating impurities. It ordinarily takes three men to complete a maximum of fifteen tests per day using the laborious bucket method, whereas one man operating my laboratory testing apparatus can complete with ease and substantially without fatigue eighteen tests per day. This saving of time and effort is particularly important in view of the need for many tests during exploration, mining and concentration of ores. The details and other advantages of my invention will become apparent from the following detailed description and in the accompanying drawings. I have shown in the drawings, for purposes of illustration only, a present preferred embodiment of the apparatus of my invention in which:

Figure 1 is a side elevation of testing apparatus incorporating my invention;

Figure 2 is a plan view of the apparatus shown in Figure 1;

Figure 3 is a vertical sectional view of the apparatus shown in Figure 1 (taken on the line III—III of Figure 1);

Figure 4 is a plan view of the table portion of the apparatus shown in Figure 1, with the other parts removed; and

Figure 5 is a perspective view of a scoop for use in conjunction with the apparatus shown in Figure 1.

Referring now more particularly to the drawings, I provide a support table **10** having a trough **11** with a bottom outlet **12**. A pair of horizontal spaced rollers **13** and **14** are rotatably mounted on the table **10** and a hollow cylindrical drum **15** is rotatably mounted on the rollers **13** and **14** by means of a pair of spaced rails **16** which extend around the drum **15** and rest upon and are in rolling engagement with the rollers **13** and **14**. An electric motor **17** is mounted on the table **10** and drives the roller **13** through a speed reduction drive from a pulley **18** keyed to the motor shaft. A belt **19** extends around the pulley **18** and thence around a larger pulley **20** keyed to an intermediate shaft **21**, and a belt **22** extends around a pulley **23** keyed to the shaft **21** and thence around a relatively larger pulley **24** keyed to a shaft **25** extending axially from and keyed to the roller **13**. The intermediate shaft **21** is rotatably mounted in a support **21***a* fastened to the top of the table **10** and a control box **17***a* for the motor is conveniently mounted on an edge of the table **10** on the same side of the drum **15** as the drum access opening hereinafter described.



The drum **15** has a circular and axially concentric opening **26** in one side thereof and has a peripheral discharge port or opening **27** disposed between rails **16** and sealed by a removable cover plate **28**. Threaded studs **29** and **30** extend radially from the drum **15** on either side of the port **27** and slidably extend through openings in the cover plate **28**, which is held in place by wing nuts **31** and **32** screwed on the respective studs **29** and **30**. Agitator bars **33** of generally equilateral triangular cross-section are spaced along the interior cylindrical surface of the drum with their ends screwed to the sides of the drum. A pair of openings with removable cover plates **34** and **35** are provided on one side of the drum in order to facilitate washing out the drum between tests.

The drum is positioned so that when the discharge port **27** is at its lowermost position during rotation of the drum it is positioned directly over the trough outlet **12** in the table. An inclined chute **36** is secured beneath the table **10** with its upper end directly below the outlet **12** and its lower end directly above a screen **38** resting on and extending across the top of a container **37**. The screen **38** is readily removable from the container **37** by means of lifting tabs **39** secured to the sides of the screen (Figure 2).

My method of using the above described apparatus to test a sample of crude ore for its high density ore content is as follows: The drum **15** is filled with water to the approximate level shown in dotted lines at **40** in Figure 1, the water having in it a suspension of sufficient ferro-silicon to float materials in the sample which have a specific gravity substantially less than that of the desired high density ore. A quantity of the sample is weighed and charged into the drum through the opening **26** and the motor **17** is turned on to drive the drum at approximately 12 revolutions per minute. The mixture in the drum is thereby agitated, especially as it tumbles over the bars **33**, and this action accelerates the separation of the high density ore from the other material The material rising to the top of the fluid mixture is scooped from the upper surface of the mixture by a scoop inserted and removed through the access opening **26**. A scoop suitable for this purpose is illustrated in Figure 5 and consists of a wire basket **41** secured to a handle **42**. The period of rotation of the drum necessary to cause substantially all of the low density material to rise so that it can be scooped out is usually about two minutes. The rotation of the drum is not interrupted during the scooping operation.

After the low density matter has been scooped out the motor **17** is turned off and the rotation of the drum is halted with the discharge port **27** directly over the trough outlet **12**. The cover plate **28** is then removed and all of the remaining mixture is drained out of the drum and down the chute **36** onto the screen **38**. The mesh of the screen **38** is selected to hold the relatively coarse ore particles and to pass the ferro-silicon particles suspended in the water. The mixture of water and ferro-silicon which passes through the screen **38** into the container **37** is substantially free of any particles of ore and ore impurities and may be used again in subsequent tests.

The mounting of the drum in my testing apparatus enables the drum to be removed and replaced for cleaning purposes between tests merely by lifting it off the rollers **13** and **14**, without disarranging the driving mechanism. The trough **11** makes it unnecessary to take time to position the discharge port **27** carefully in order to prevent spilling and consequent loss of any part of the sample during the draining of the drum. The rails **16** serve to channel fluid down along the cylindrical side of the drum onto trough **11** if part of the sample spills out of the drum while it is being rocked back and forth to get the last of the sample out past the baffles adjacent the uncovered port **27**, or while the drum is rotated to bring the port **27** into lowermost position if the cover plate **28** should be removed while in uppermost position

(shown in Figure 1). These and the other above described features of my apparatus make it possible to conduct a maximum number of tests with a minimum amount of time and effort and contribute to the superior efficiency of my method and apparatus as compared with previous testing practices.

While I have shown and described a preferred embodiment of my invention and have illustrated a present preferred method of practicing the same, it is to be distinctly understood that the invention is not limited thereto but may be otherwise variously employed, embodied, and practiced within the scope of the following claims.

I claim:

1. Apparatus for testing the high density ore content of a crude ore sample, comprising a container rotatable about a substantially horizontal axis, means to rotate the container, an axially located and unobstructed access opening in the container through which the sample to be tested and a liquid containing fine particles in suspension are chargeable into the container and through which a scoop may be inserted to remove relatively light materials floating to the top of the liquid mixture in the container, a peripherally located discharge opening in the container through which the balance of the mixture may be drained out of the container, a cover removably mounted over said peripheral opening, and a screen disposed to receive the said balance of the mixture draining out of the container and adapted to pass the said liquid and fine particles while retaining substantially all of the ore particles.

2. Apparatus for testing the high density ore content of a crude ore sample, comprising a container rotatable about a substantially horizontal axis, means to rotate the container, an axially located and unobstructed access opening in the container through which the sample to be tested and a liquid containing fine particles in suspension are chargeable into the container and through which a scoop may be inserted to remove relatively light materials floating to the top of the liquid mixture in the container, a peripherally located discharge opening in the container through which the balance of the mixture may be drained out of the container, a cover removably mounted over said peripheral opening, a screen disposed to receive the said balance of the mixture draining out of the container and adapted to pass the said liquid and fine particles while retaining substantially all of the ore particles, and a container beneath and supporting the screen to hold the liquid and the fine particles therein for subsequent re-use.

3. Apparatus for testing high density ore content of a crude ore sample, comprising a container rotatable about a substantially horizontal axis, means to rotate the container, an axially concentric circular and unobstructed access opening in the container through which the sample to be tested and a liquid containing fine particles in suspension are chargeable into the container and through which a scoop may be inserted to remove relatively light materials floating to the top of the liquid mixture in the container, spaced bars disposed against the interior peripheral surface of the container for agitating the mixture during rotation of the container, a peripherally located discharge opening in the container through which the balance of the mixture may be drained out of the container, a cover removably mounted over said peripheral opening, and a screen disposed to receive the said balance of the mixture draining out of the container and adapted to pass the said liquid and fine particles while retaining substantially all of the ore particles.

4. Apparatus for testing the high density ore content of a crude ore sample, comprising a container rotatable about a substantially horizontal axis, means to rotate the container, an axially located and unobstructed access opening in the container through which the sample to be tested and a liquid containing fine particles in suspension are chargeable into the container and through which a scoop may be inserted to remove relatively light materials floating to the top of the liquid mixture in the container, a peripherally located discharge opening in the container through which the balance of the mixture may be drained out of the container, a cover removably mounted over said peripheral opening, and a trough disposed below the container and extending laterally beneath a wide range of positions of the discharge opening as it swings toward and past its lowermost position, said trough being downwardly slanted toward an outlet opening therein, whereby the balance of the mixture draining out of the container is caught so that it may all be directed onto a suitable screen for isolating the heavy density ore particles, said screen being positioned beneath the lower end of the trough.



5. Apparatus for testing the high density ore content of a crude ore sample, comprising a hollow cylindrical drum rotatable about a substantially horizontal axis, means to rotate the drum, an axially concentric circular and unobstructed opening in the drum through which ore to be tested and a liquid containing fine particles in suspension are chargeable into the drum and through which a scoop may be inserted to remove relatively light materials floating to the top of the liquid mixture in the drum, spaced bars of triangular cross-section extending parallel to the axis of rotation and disposed against the interior peripheral surface of the drum for agitating mixture during rotation of the drum, a discharge opening in the cylindrical wall of the drum through which the balance of the mixture may be drained out of the drum, a cover removably mounted over the said discharge opening, a slanting chute having its upper end disposed to receive the discharge from the said latter opening when it is in its lowermost position, and a screen positioned beneath the lower end of the chute and adapted to pass the said liquid and fine particles while retaining substantially all of the ore particles.

6. Apparatus according to claim 5 in which the drum is supported and rotated by means comprising a pair of spaced parallel rollers, means secured to and extending around the outer cylindrical portion of the drum and resting upon said rollers, and driving means connected to one of said rollers, whereby the drum may readily be removed for cleaning and then replaced without disturbing or adjusting the driving connections.

7. Apparatus according to claim 5 in which a trough is disposed beneath the drum with a discharge opening in the trough disposed directly above the upper end of the discharge chute, thereby preventing any loss of the test sample as a result of inaccurate positioning of the drum discharge opening during the draining of the drum.

8. Apparatus for testing samples of ore and the like, comprising a portable hollow cylindrical drum, a structure including a trough, and a pair of spaced rollers mounted on said structure to rotate about parallel horizontal axes spaced apart less than the diameter of the drum, said drum having a pair of spaced rails extending around its cylindrical side and adapted to removably rest and roll on said rollers to support the drum over the trough for rotation about a horizontal axis, said drum having a pair of spaced parallel circular end walls and a cylindrical wall extending between and secured to the edges of the end walls to retain liquid in the lower portion of the drum while it is mounted on said rollers, one of said end walls having a concentric circular unobstructed opening therethrough for access into the interior of the drum, said cylindrical wall having a discharge opening therethrough disposed between said rails, and said drum having a series of spaced solid structural members parallel to the drum axis and each in the form of a prism of generally equilateral triangular cross section with one side against the interior surface of the cylindrical wall of the drum, said members being secured at their opposite ends to the end walls of the drum and serving to brace the cylindrical wall of the drum against deflection of the rails as they pass over the rollers and also to agitate the liquid in the drum as the drum rotates on the rollers.


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