J. N. FLOOD.

AUTOMATIC ELECTRIC SAMPLER.

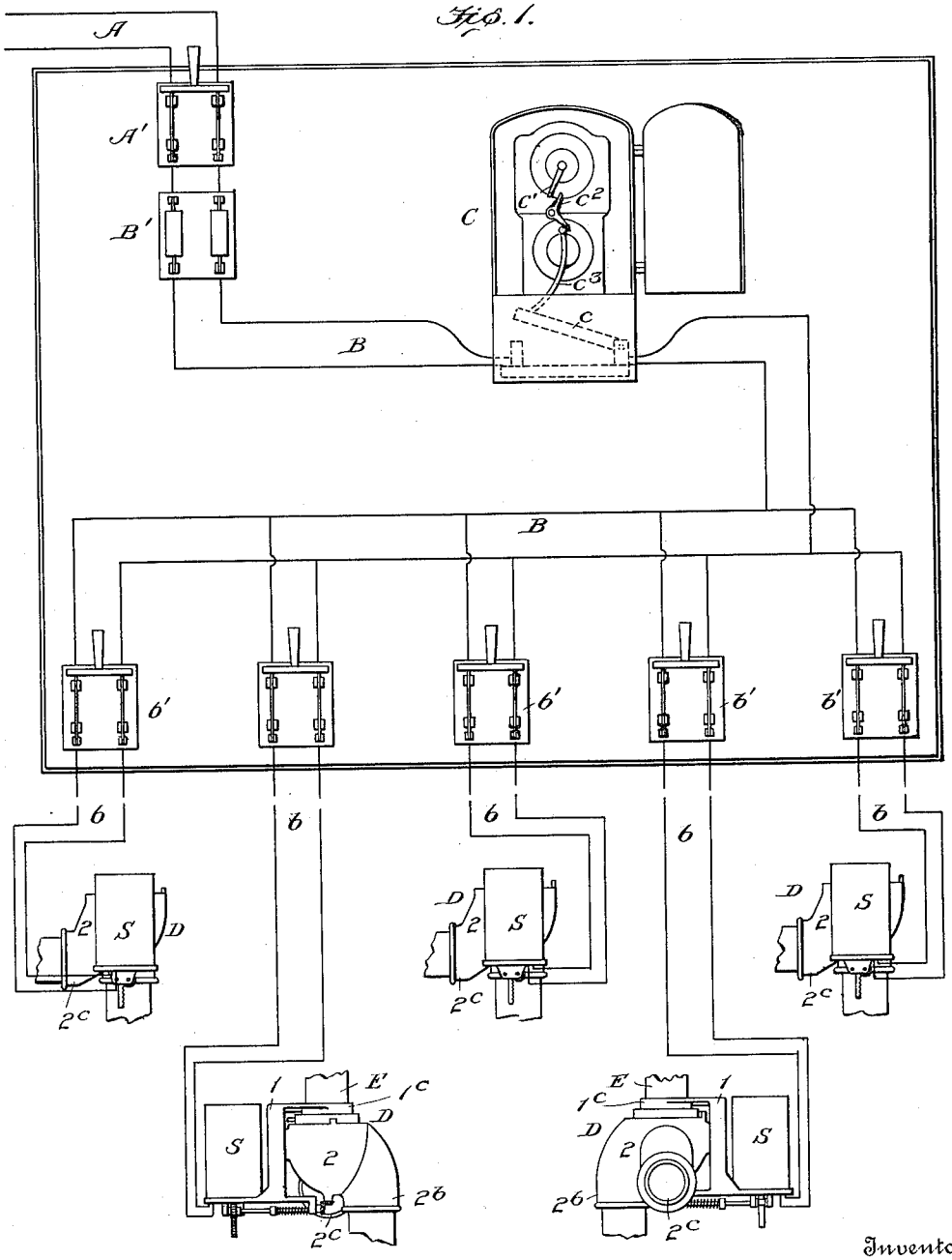
APPLICATION FILED MAY 12, 1910.

**1,010,032.**

**Patented Nov. 28, 1911.**

3 SHEETS—SHEET 1.

Fig. 1.




Witnesses

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3 SHEETS—SHEET 2.

Fig. 2.

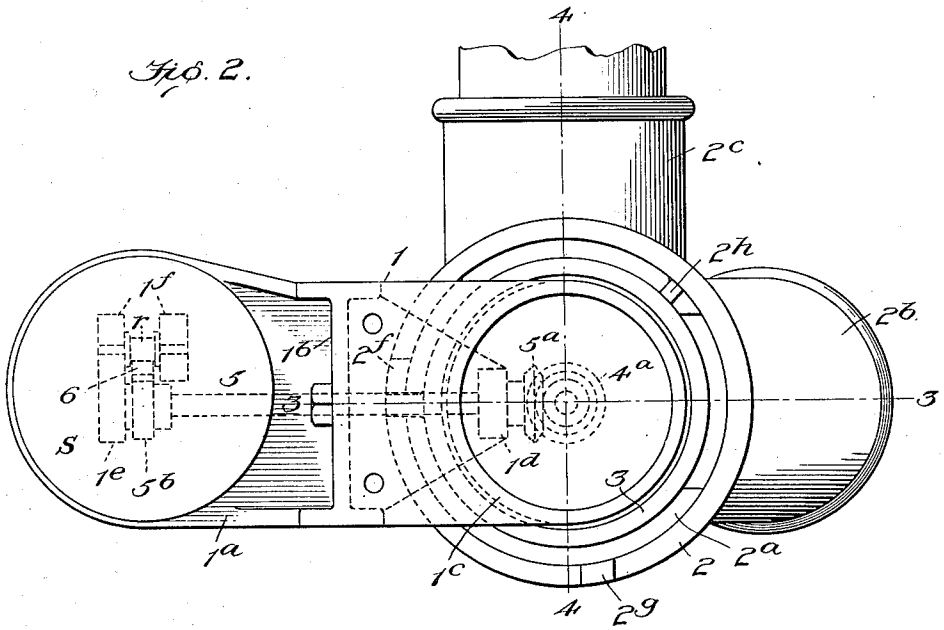
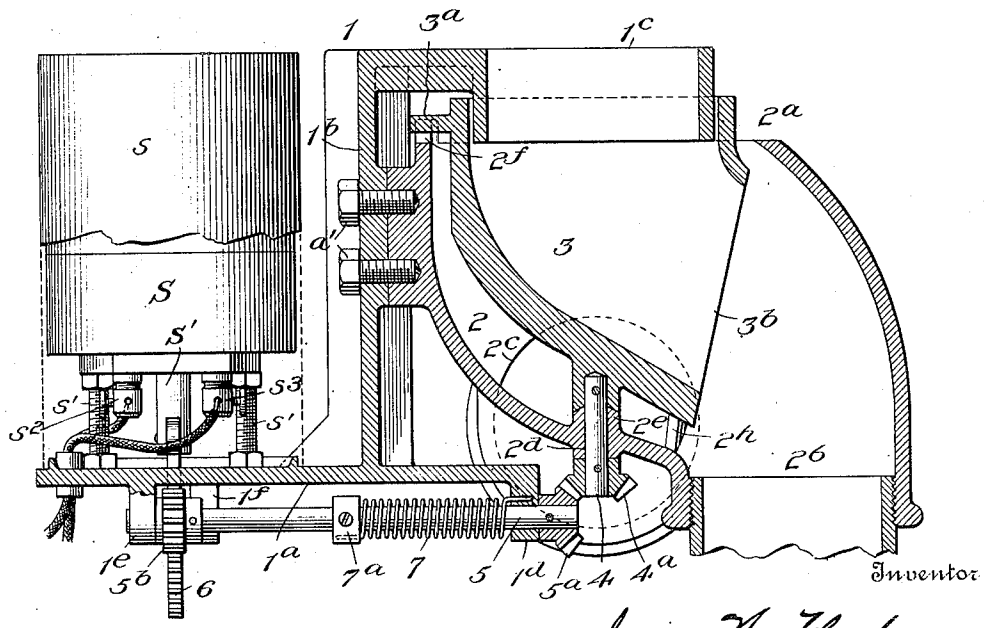



Fig. 3.

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3 SHEETS—SHEET 3.

Fig. 4.

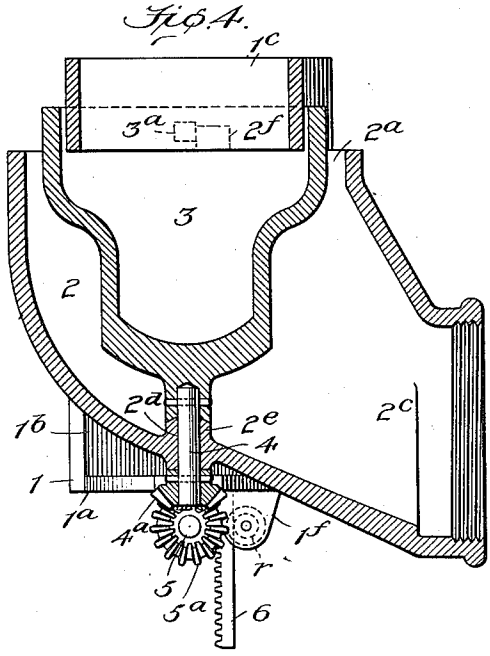



Fig. 5.

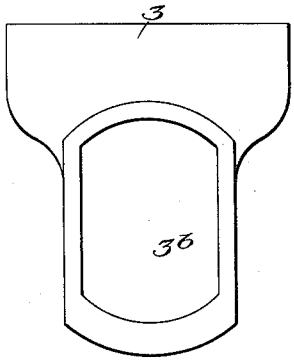



Fig. 7.

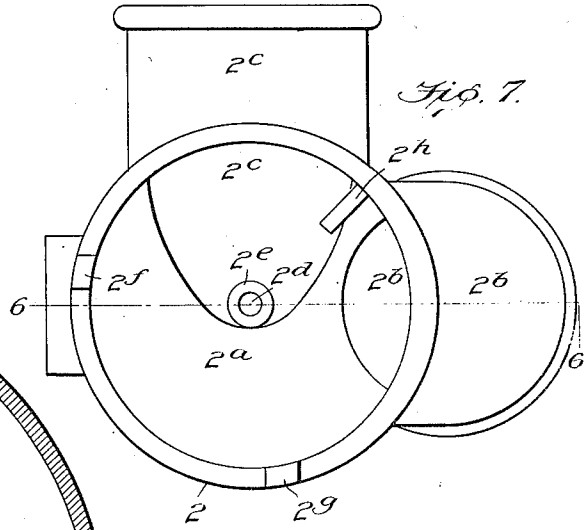
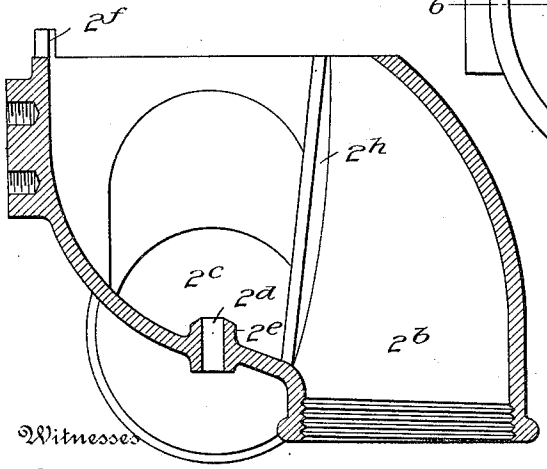



Fig. 6.

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# UNITED STATES PATENT OFFICE.

JAMES N. FLOOD, OF DENVER, COLORADO.

## AUTOMATIC ELECTRIC SAMPLER.

1,010,032. Specification of Letters Patent. Patented Nov. 28, 1911.

Application filed May 12, 1910. Serial No. 560,907.

*To all whom it may concern:*

Be it known that I, JAMES N. FLOOD, a citizen of the United States, residing at Denver, in the county of Denver and State of Colorado, have invented certain new and useful Improvements in Automatic Electric Samplers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to that class of devices commonly termed samplers employed for obtaining one or more average samples from a moving mass or stream of comminuted material.

In the operation of mills for the treatment of ores in the pulverized state, it has been found desirable to have accurate samples of the crude ore, the concentrates and the tailings, taken at regular intervals and for definite periods in order to determine, by assay, the percentage of metals or values contained in the mass. It has also been found desirable that these samples should be withdrawn from the mass or stream by means which insure the taking of a fair and uniform sample without being affected by the natural tendency of the coarser and finer particles and the light and heavy particles to separate into classes or stratify. Furthermore, in order to eliminate any error, such as might arise from negligence or fraud, where human agency is relied on in taking such samples, it has been found desirable that the operation of the sampler should be automatic.

To accomplish the several ends above noted, I combine a sampler having a movable deflector and a solenoid or similar motor for actuating the deflector of the sampler, with an electric circuit through which the motor is energized, and a clock actuated switch for closing the said circuit, whereby the deflector may be automatically actuated at definite time-intervals and for definite periods, of relative short duration, and such a combination embodies one feature of my invention. I also combine, in a sampler, a shell or casing having an inlet and a plurality of outlets, and a movable deflector, whereby, when the deflector is actuated, a sample which constitutes an entire cross-section of the stream is taken, and such a construction embodies a second feature of my invention.

There are other, minor, features of invention residing in particular combinations and elemental constructions, all as will hereinafter more fully appear.

In the drawings chosen for the purpose of illustrating my invention, the scope of which will be pointed out in the claims—Figure 1 is a diagram of a number of samplers connected in parallel, and a clock actuated switch or circuit closer for closing the circuit through which the sampler motor is energized. Fig. 2 is a plan view of the sampler and the solenoid for actuating the deflector of the sampler; Fig. 3 is a sectional view of the sampler taken in the plane of the line 3—3, Fig. 2, and a view in elevation of the solenoid, part of the cover of the solenoid being broken away; Fig. 4 is a sectional view of the sampler taken in the plane of the line 4—4, Fig. 2; Fig. 5 is a front view, in elevation, of the deflector or swinging spout; Fig. 6 is a sectional view of the casing or shell of the sampler, taken in the plane of the line 6—6, Fig. 7; and Fig. 7 is a plan view of the shell or casing of the sampler.

Like symbols refer to like parts wherever they occur.

I will now proceed to describe my invention more fully, so that others skilled in the art to which it appertains may apply the same.

In the diagram, Fig. 1, of the drawings, A indicates the power circuit lines, B the main or supply conductors, C a clock or timing mechanism for the control of a switch *c* located in the main conductor circuit, *b*. *b*, branch circuits connected in parallel to the main conductors, and D samplers located in said branch circuits. Knife switch A′ and safety fuses B′ are interposed between the power circuit A and the main or supply conductors B, and knife switches *b*′ are provided in the branch circuits *b* leading to the respective samplers D.

The clock or timing mechanism C for closing the switch *c* may be of any suitable character such as will permit of proper adjustment to control the intervals between and period or duration of the closure of the switch. Inasmuch as any of several well known forms of such timing mechanism may

be utilized in the claimed combination, and as no claim for the timing mechanism *per se* is made herein, I have conventionally illustrated such mechanism as a tappet arm $c'$ fixed to the hand arbor of a clock, a rocker-arm $c^2$ or dog actuated thereby, and a link $c^3$ pivoted eccentrically on a disk carried by a second arbor actuated by the clock mechanism. This time switch mechanism may be located in the mill office, or at any point from which it is desired to control the operation of the samplers, as will be readily understood.

1 indicates the supporting frame by means of which the sampler is secured in proper relation to the path of the material to be sampled, whether the same be the crude ore or pulp on its way to the concentrator or the concentrates and tailings which pass from the concentrator. This frame comprises the member $1^a$ for the support of a solenoid S and the driving gear through which the solenoid actuates the deflector of the sampler, the member $1^b$ to which the shell or casing of the sampler is secured by suitable bolts, and the annular member $1^c$ which serves as a guide for both the induction or feed pipe E and the oscillatory deflector 3 of the sampler.

2 indicates the shell or casing of the sampler which is secured to the frame 1 by bolts $a'$ or in other suitable manner. This shell or casing is provided with an open top or inlet orifice $2^a$ for the reception of the delivery end of the feed-pipe and with two outlet orifices, the one $2^b$, which is the regular discharge outlet, leading to the storage receptacle or the concentrator, as the case may be, and the other, $2^c$, being the sample discharge outlet and leading to the sample receiving receptacle. The bottom of the shell or casing 2 is perforated as at $2^d$ to constitute the journal bearing of a short shaft 4 which carries the deflector 3 of the sampler, said deflector being stepped on the annular boss $2^e$ that surrounds the said perforation $2^d$. The upper rim or lip of the casing or shell is provided with two limit lugs $2^f$ and $2^g$ which coact with a projection $3^a$ on the deflector to limit the rotation of the latter so that the delivery outlet of the deflector may alternately register with the regular discharge outlet $2^b$ and the sample discharge outlet $2^c$ of casing or shell 2. On the interior of the shell or casing 2 and interposed between said outlets $2^b$ and $2^c$ thereof is a substantially vertical inwardly projecting flange or partition $2^h$, which serves to insure the proper delivery of the material passing through the deflector.

The deflector 3 of the sampler has the general contour of a pipe elbow, the inlet and outlet orifices being substantially at right angles to each other. This deflector is stepped on the boss $2^e$ within the casing 2, is provided on its periphery with a projection $3^a$ which is adapted to engage one or the other of the limit lugs $2^f$ $2^g$ on the casing to thus insure the registry of its outlet $3^b$ with one or the other of the outlets of the casing 2, and is oscillated by means of a short shaft 4 to which it is secured, said shaft passing through the orifice $2^d$ in the bottom of the shell or casing 2, as previously explained. The shaft 4 is provided with a pinion $4^a$ which meshes with a pinion $5^a$ that is mounted on a drive shaft 5, said shaft 5 having a gear wheel $5^b$ that engages a rack bar 6 which is attached to the core S' of the solenoid S. Through the medium of these devices the deflector is oscillated in one direction.

5 indicates the drive shaft which is journaled adjacent to its opposite ends in pendant lugs $1^d$ and $1^e$ on the under side of the member $1^a$ of the frame 1. This shaft 5 is encircled by a coiled spring 7, one end of which is secured to the lug $1^d$ in which the shaft 5 is journaled, and the other end of which is secured to the shaft 5, as at $7^a$, so that, when the drive shaft 5 is rotated in one direction by the rack 6 attached to the core of the solenoid, the torsion of the spring 7 will cause the reverse rotation of shaft 5 when the solenoid is deënergized.

S indicates a solenoid, and $s$ the cover thereof. This solenoid is supported from and above the member $1^a$ of the frame 1 by means of standards $s'$ and is provided with the usual binding posts $s^2$ $s^3$ for connecting the terminals of the circuit wires with the solenoid.

S' indicates the core of the solenoid to which is secured the rack 6 that meshes with the gear wheel $5^b$ of the drive shaft 5. In order to insure the proper engagement of the rack 6 and gear wheel 5, a small roller $r$ (shown in dotted lines, Figs. 2 and 4) is arranged back of the rack, said roller being journaled in pendant lugs $1^f$ on the under side of the member $1^a$ of the frame 1.

The operation of the foregoing devices will be as follows: The material to be sampled will flow from the feed pipe E into the deflector 3 of the sampler and thence out through the outlet orifice $3^b$ thereof and through the regular discharge or outlet pipe $2^b$ of the shell or casing 2 in an uninterrupted flow so long as the main circuit B is open. The instant the clock or time mechanism closes the switch $c$ and the solenoid S is energized, the core S' of the solenoid rises and with it the rack 6, which, through the medium of the gear wheel $5^b$, rotates the drive shaft 5. The shaft 5 acting through the short shaft 4 oscillates the deflector 3 until said deflector is arrested by the engagement of its projection $3^a$ with the limit lug $2^g$ on the shell or casing 2, at which time the outlet $3^b$ is in register with the

sample orifice $2^c$ of the case. By this rotation of the drive shaft 5 and deflector 3 the spiral spring 7 is energized. The deflector 3 remains in this position as long as the solenoid is energized and the whole stream of the material to be sampled is thus for a period diverted to the sample receiving receptacle. The instant the time mechanism opens the switch *c* in the main circuit, the solenoid S is deënergized, which permits the core S′ to descend and thereupon the reaction of the spring 7 imparts a reverse rotation to the drive shaft 5 which causes the deflector 3 to turn until the projection $3^a$ thereon engages the limit lug $2^f$ on the shell or case of the sampler, at which time the outlet $3^b$ of the deflector is again in register with the regular discharge orifice $2^b$ of the casing and the usual flow of the stream is reëstablished.

To illustrate the utility of the sampler, suppose the time switch mechanism has been set to take a sample of the crude ore or pulp at intervals of an hour and for a period having a duration of six seconds, and the sample receiving receptacle is emptied at the end of 24 hours, its contents dried and the weight thereof found to be 200 lbs. It follows that the weight of each six-second sample averaged 8⅓ lbs. and that the flow through the sampler must have been at the rate of 5000 lbs. an hour which is the equivalent of 120.000 lbs. or 60 tons in the 24 hour day. It will thus be seen that by the use of this sampler a very close check can be kept on the daily capacity of the mill. If samples have been also taken of the concentrates and tailings, and said samples are dried, weighed and the results used as the basis of calculation as in the case of the crude ore, the sum of their weights should equal that of the crude ore, thus affording a check upon the efficiency of the mill. Assays being made of said samples of ore, concentrates and tailings, the weights of which are known, data is obtained for any other information which may be desired.

It will be noted that the samplers may be used on any circuit, either alternating or direct, and that any individual machine or combination of units may be sampled by closing the circuit or circuits containing the appropriate sampler or samplers.

Having thus described my invention, what I claim and desire to secure by Letters Patent, is:—

1. The combination with a sampler having a deflector and a motor for actuating the deflector, of an electric circuit in which the deflector motor is included, and a time switch for closing the circuit at regular intervals and for a predetermined period of relatively short duration.

2. The combination of a plurality of samplers and motors therefor, said motors being included in the electric circuits and connected in parallel, and a time switch for closing the circuit at regular intervals and for a predetermined period of relatively short duration.

3. The combination with a sampler having a deflector, of a solenoid for actuating said deflector, an electrical circuit for supplying energy to said solenoid, and a time switch for closing said circuit at regular intervals and for a predetermined period of relatively short duration.

4. The combination of a sampler having an oscillatory deflector, a driving shaft for actuating the deflector of the sampler, a solenoid for rotating the driving shaft in one direction and a torsion spring for reversely rotating the driving shaft, and an electric circuit in which the solenoid is included.

5. In a sampler, the combination with a casing having an inlet orifice and a plurality of outlet orifices and limit lugs adapted to arrest a deflector, of an oscillatory deflector having an inlet orifice and an outlet orifice and means for engaging the limit lugs on the shell or casing, a shaft for the oscillatory deflector having a pinion for engaging a driving shaft, a driving shaft having a pinion for engaging the pinion on the shaft of the oscillatory deflector, a coiled torsion spring which encircles the driving shaft and is connected therewith and with a fixed point off the shaft for reversely rotating the shaft, means for rotating the driving shaft in one direction, and means for energizing the means which rotates the driving shaft in one direction.

6. In a sampler, the combination of a plurality of relatively movable members one of which has an inlet orifice and an outlet orifice which permit the continuous passage of the material to be sampled, and the other of said members having a plurality of outlet orifices which are adapted to be alternately opened by the relative movement of the members, and means for causing a relative movement of said members.

In testimony whereof I affix my signature, in presence of two subscribing witnesses.

JAMES N. FLOOD.

Witnesses:
S. R. SWAIN,
W. E. ADAMS.