No. 694,734. Patented Mar. 4, 1902.

C. R. FOSTER & W. COOLIDGE.

ORE SAMPLER.

(Application filed Aug. 5, 1901.)

(No Model.) 2 Sheets—Sheet 1.

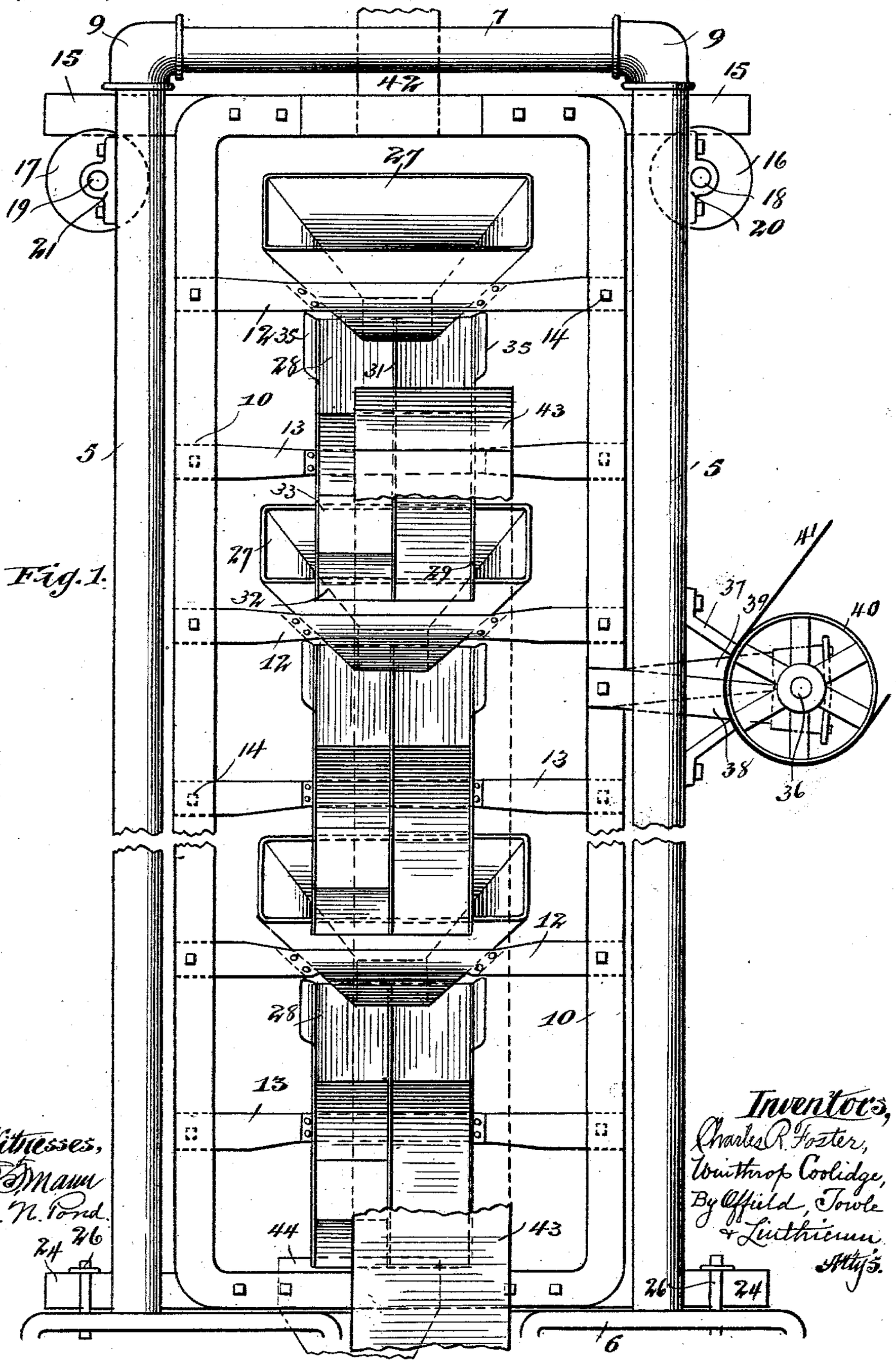

Fig. 1.

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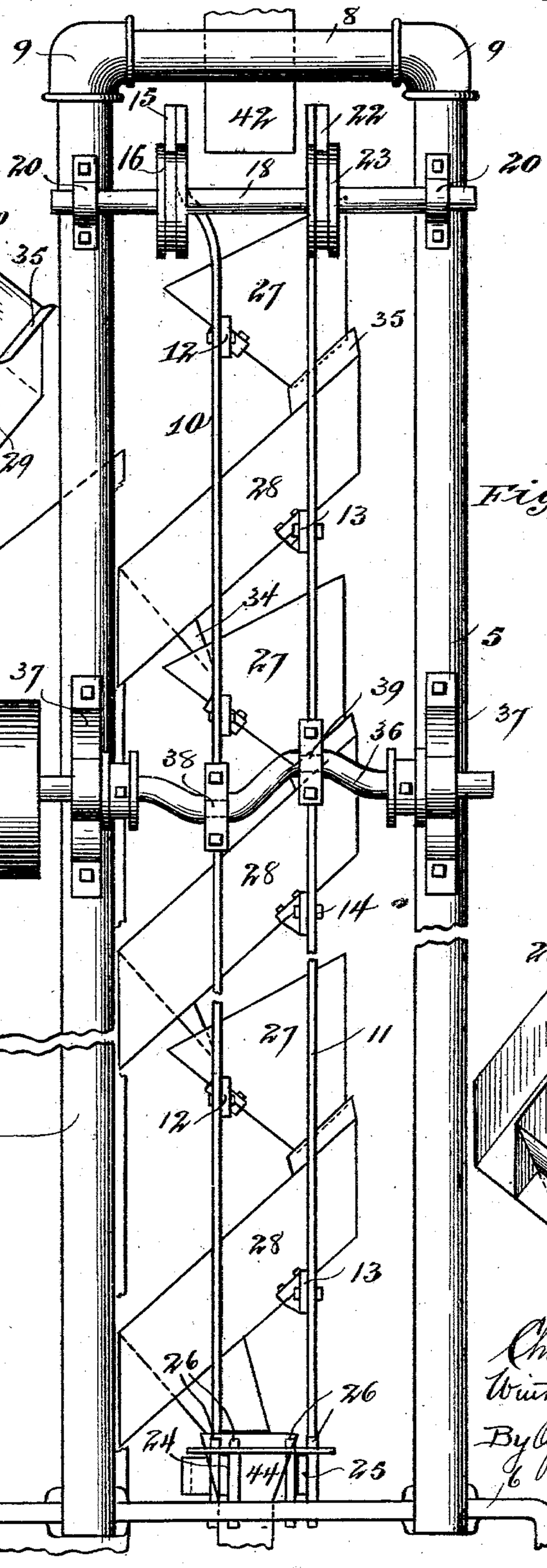

Fig. 2.

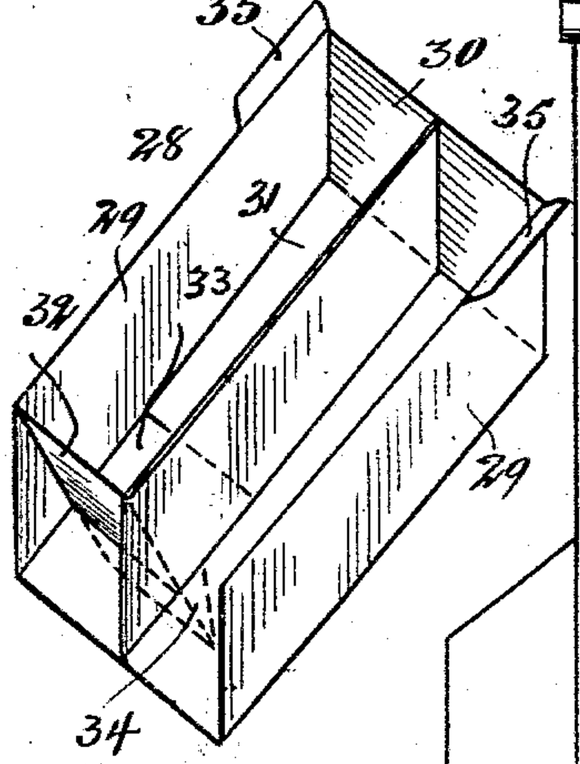

Fig. 3.

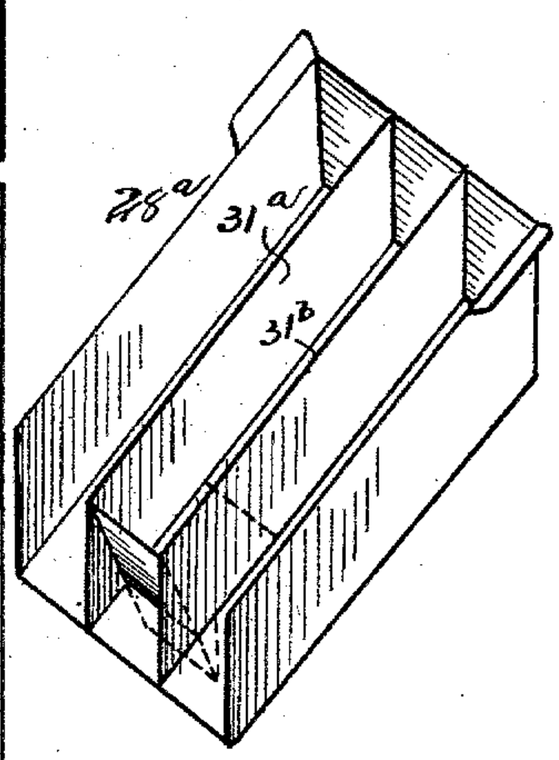

Fig. 4.

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UNITED STATES PATENT OFFICE.

CHARLES R. FOSTER, OF BLUE ISLAND, AND WINTHROP COOLIDGE, OF CHICAGO, ILLINOIS.

ORE-SAMPLER.

SPECIFICATION forming part of Letters Patent No. 694,734, dated March 4, 1902.

Application filed August 5, 1901. Serial No. 70,895. (No model.)

To all whom it may concern:

Be it known that we, CHARLES R. FOSTER, residing at Blue Island, and WINTHROP COOLIDGE, residing at Chicago, in the county of Cook and State of Illinois, citizens of the United States, have invented certain new and useful Improvements in Ore-Samplers, of which the following is a specification.

Our invention relates to ore-dividers, and has for its principal object to provide a machine capable of rendering a thoroughly representative sample out of a given body or volume of ore passed therethrough. Numerous machines of this character are now in use; but a common fault with even the best of them lies in the fact that they permit the passage of considerable quantities of ore without representation in the sample. A thoroughly perfect machine of this character must be capable of rendering a representative sample from any and all parts or divisions of a given volume of ore passed therethrough, and in our present invention we have sought to attain this result in as nearly a perfect manner as the limitations of the mechanism capable of handling a large volume of ore with celerity and expedition will permit.

Among other minor objects of our invention may be mentioned the handling of moist or damp ore to obtain a thoroughly representative sample therefrom with no less facility than dry ore is handled, a comparatively simple and economical construction of machine which may be operated with very little power and which is easily cleaned and the parts or elements of which may be readily replaced when worn, and also the effecting of a large reduction of the ore passed therethrough, with the retention therefrom of a thoroughly representative sample.

Other minor objects and advantages resulting from our invention will appear later in the subjoined description thereof.

To the above and other ends our invention resides, therefore, in an ore-sampling machine having as its distinguishing and essential characteristic a series of alternately-disposed hoppers and dividers secured, respectively, to laterally-reciprocating frames, the body of ore passing through such hoppers and dividers by gravity and its volume being reduced at each passage through a divider, which latter retains a certain fraction of the ore received from the preceding hopper, out of which the final sample is obtained. Our invention in this preferred form is illustrated in the drawings accompanying this specification, in which—

Figure 1 represents a front elevation, broken away through an intermediate part thereof, of a sampler embodying our invention. Fig. 2 is a side or edge elevation of the same. Fig. 3 is a detail view in perspective of one of the dividers shown in Figs. 1 and 2, and Fig. 4 is a similar detail perspective view of a slightly-modified form of divider.

Referring to the drawings, the framework of our machine comprises a generally rectangular upright structure having four parallel standards, (designated by 5,) these latter resting upon a suitable base 6 and connected at their upper ends by horizontal front and rear members 7 and side members 8. The upright and horizontal members of this frame are conveniently and economically formed of pipe-sections, the adjacent or meeting ends of which may conveniently be united by three-part unions 9, as shown.

10 and 11 indicate a pair of upright rectangular frames disposed within the outer supporting-frame of the machine and occupying substantially side-by-side parallel vertical positions therein. At suitable regular intervals cross-bars 12 and 13 extend across and between the side members of the frames 10 and 11, respectively, being secured thereto by rivets or bolts 14, or in any other suitable manner.

To the top horizontal member of the frame 10 is bolted or otherwise secured a horizontal bar 15, the outer ends of which lie in and upon the grooved peripheries of a pair of rollers 16 and 17, these latter being mounted upon horizontal shafts 18 and 19, journaled, respectively, in suitable brackets 20 and 21 on the upper ends of the uprights 5, these shafts 18 and 19 extending along the sides of the machine from front to rear thereof. To the top horizontal member of the frame 11 is similarly secured another bar 22, which latter rides over the grooved peripheries of a pair of rollers 23, also mounted on the shafts 18

and 19, alongside of and at a suitable distance from the rollers 16 and 17.

From the foregoing it will be evident that the frames 10 and 11 and their contents, as hereinafter described, are suspended upon and from the rollers above described in such manner as to permit an easy lateral oscillation of the frames upon said rollers, and in order to guide the lower ends of the frames and insure the constant parallelism of their arrangement we preferably employ a pair of guide-bars 24 and 25, secured to the lower ends of said frames and corresponding to and parallel with the upper bars 15 and 22, which lower guide-bars 24 and 25 at their extremities play between suitable parallel vertical guide-pins 26, as best shown in Fig. 2.

On each of the cross-bars 12 of the frame 10, and preferably about centrally thereof, is fixedly secured a hopper 27, and similarly to each of the cross-bars 13 of the frame 11 is rigidly secured a divider, (designated as a whole by 28.) The hoppers 27 are all alike and each possesses a comparatively large mouth and tapers inwardly both on its ends and sides, as shown in Figs. 1 and 2, respectively, to a reduced discharge-opening in its bottom. The hopper is preferably secured to its appropriate supporting-bar 12, substantially centrally of one side wall thereof, as shown in Fig. 2; but its precise mode or means of support is immaterial and may be varied, as expediency may dictate. Each of the dividers 28, which are all alike, comprises a box-like structure of generally rectangular form in plan view, the side walls 29 of which are in rhomboid form, as shown in Fig. 2. The divider has a solid upper end wall 30 and is divided longitudinally by a centrally-located vertical partition 31 into a pair of parallel and equal-sized chambers. One of these chambers (the left-hand chamber, as shown in Fig. 3) has at its lower end a transverse partition-wall 32, closing the lower end thereof, and through the base or bottom wall of this chamber, immediately in front of the wall 32, is formed an opening 33. The wall 32 extends through and below the base of the chamber for a considerable distance and is provided with triangular wings or sides 34, lying between the lower end of such extension and the lower edge of the side wall 29 and the intermediate partition 31. The lower end of the opposite or right-hand chamber is entirely open. Each divider is further provided along the upper ends of its side walls 29 with outwardly-flaring ears or flanges 35 for a purpose which will appear later in the description of the operation. Hoppers and dividers 27 and 28, respectively thus constructed, are disposed on the frames 10 and 11, respectively, in alternating relation, as shown, the lower end of each hopper lying directly above the upper end of the subjacent divider and the discharge-opening 33 of each divider overlying the mouth of the subjacent hopper.

Our invention contemplates means for effecting the simultaneously and opposite lateral reciprocation of the frames 10 and 11 and their contents, as above described. A simple means for effecting this relative movement of the frames comprises an **S**-shaft 36, suitably journaled in brackets 37, secured to the uprights 5 at one side of the machine. Pitmen 38 and 39 connect the bends of this shaft with the frames 10 and 11, respectively, and a belt-pulley 40 and belt 41 serve for the application of power from any suitable source to the shaft 35.

42 indicates the lower end of a suitable supply-chute disposed above the mouth of the topmost hopper 27, and 43 designates a suitable discharge-chute applied to the front of the machine and having suitable openings in its rear wall where the latter registers with the lower discharge-openings of the discarding-chambers of the dividers. This latter is plainly shown in Fig. 2 and also indicated in Fig. 1, the greater portion thereof in the latter figure being broken out to avoid confusion in the illustration of the underlying parts.

44 designates a suitable sample-receiving vessel located beneath the discharge-orifice of the lowermost divider.

The operation of our invention will be readily understood from the foregoing description of its construction and the relative disposition of its several parts, but may be briefly set forth as follows: The ore is fed by gravity from an elevated bin or other source of supply through the receiving-chute 42, whence it falls in a continuous stream of practically uniform volume into the uppermost hopper 27. Power having been applied to the shaft 36, the frames 10 and 11 are caused to reciprocate on their supporting-rollers simultaneously in opposite directions laterally of the machine. The upper or receiving mouth of the hopper 27 is of sufficient width to be under the chute 42 in all positions or throughout the entire lateral travel of the said hopper. The ore passing into the upper hopper 27 falls thence through the discharge-opening in the bottom thereof into the upper end of the first divider 28. In view of the uniform relative travel of the hopper and divider laterally of each other the ore falling from the hopper flows in a uniform stream first into one chamber and then into the other of the divider, being so distributed that each chamber receives practically one-half the ore. The ore that falls into the right-hand chamber is discharged by gravity, augmented by the lateral shaking movement of the divider, into and through the discharge-chute 43. That portion of the ore which is retained in the left-hand chamber is discharged through the opening 33 therein into the next underlying hopper 27. From this hopper the ore passes into the next underlying divider 28, being evenly and equally distributed between the two chambers thereof, the ore thus received in the second divider being disposed of in precisely the same manner as already described in connection with the first divider. In this manner the entire body of ore being

tested passes in a constant stream or flow through the entire series of hoppers and dividers until the fraction finally extracted is retained in the sample-receiving vessel 44, located under the discharge-opening of the lowermost divider. It will be seen that in this way a large reduction of the original body of ore is obtained, the sample constituting a fractional portion of the entire body of ore corresponding, of course, with the number of pairs of hoppers and dividers employed in the series, it being noted that in passing through each pair the volume of ore received from the preceding pair is diminished by one-half. Our invention is by no means limited to the employment of any particular number of hoppers and dividers, since this may obviously be varied to suit the requirements or preferences of the operator and the character of the ore handled.

In Fig. 4 we have illustrated a slightly-modified form of divider, by the use of which it will be possible to obtain the same or a greater degree of reduction with a less number of dividers than in the construction already described. This divider, which we have designated as a whole by 28^a, has two longitudinal partitions 31^a and 31^b, dividing the box into three parallel chambers, the intermediate of which constitutes the sample-retaining chamber, while those lying on either side thereof have their discharge ends open and constitute discarding-chambers. This divider, it will be seen, retains one-third of the ore received from the superjacent hopper and discards two-thirds.

The ears or oblique flanges 35, formed on the upper ends of the side walls of the dividers, serve as guards to prevent the accidental escape of ore due to the shaking of its containing-receptacles and insures that all the ore discharged from a hopper shall be transmitted to the chambers of the underlying divider without waste or overflow. The triangular guards or side walls 34 perform a similar function in connection with the transmission of the ore from the sample-retaining chamber of the divider into the next underlying hopper.

Among the several advantages possessed by the hereinabove-described machine may be mentioned the fact that by simultaneously reciprocating both the hoppers and dividers in opposite directions the absolute movement of each is required to be but one-half what the movement of either would be were the other stationary. Owing to the fact that the entire weight of the moving parts is supported on rollers of considerable size the friction is reduced to a minimum and but very little power is required to operate the machine, this power being applied, preferably, through the simple crank motion shown and described. The ore flows by gravity through the entire machine, and owing to the constant agitation of the ore-receptacles this flow is as uniform and uninterrupted in the case of damp ore as in the case of dry ore. Moreover, the parts are readily removable and replaceable by new parts when worn, and the entire machine can easily be cleaned, since it can be reached by hand without the removal of any part. Moreover, the lateral motion makes it possible to set the dividers and sides of the hoppers at comparatively low angles and still have the ore run freely through the machine.

We are aware that heretofore in machines of this type pivoted dividers capable of swinging laterally have been employed in connection with stationary hoppers; also, that oscillating wings or dividers have been employed at the junction of two discharge-chutes to split the stream of ore flowing therethrough. Our invention, however, is radically different from all such devices in that both the hopper and dividers are given lateral shaking motions in relatively opposite directions, whereby the body of ore itself is in constant process of agitation and mixing, while the particles of the final sample are taken uniformly from every part of the main body in its progress through the machine, and thus the final residue constitutes a thoroughly representative sample of the body of ore tested.

While we have hereinabove described the preferred form in which our invention is embodied, the operative principle of our invention is by no means limited to the exact form, construction, or disposition of the elements shown and described, since it will be obvious that the latter may be widely varied within the choice or judgment of the builder and still be within the spirit and scope of our invention.

We claim as our invention—

1. In an ore-sampling machine the combination of a hopper and a divider disposed one above the other and means for imparting to said hopper and divider simultaneous lateral reciprocating movements in opposite directions, substantially as described.

2. In an ore-sampling machine the combination with a hopper of a divider disposed therebeneath, said divider having adjacent ore retaining and discharging chambers formed side by side therein and longitudinally thereof, and means for imparting to said hopper and divider simultaneous lateral reciprocating movements in opposite directions sufficient to cause a relative travel of the discharge end of the hopper across the entire width of the divider, substantially as described.

3. An ore-sampling machine, comprising in combination an upright supporting-frame, a pair of vertical frames mounted side by side so as to be capable of lateral reciprocation within said supporting-frame, a series of hoppers and dividers fixedly secured in said vertical frames respectively and so disposed as to present a vertical series of alternate hoppers and dividers, and means for imparting to said vertical frames simultaneous lateral reciprocations in opposite directions, substantially as described.

4. An ore-sampling machine, comprising in combination a supporting-frame, a pair of parallel hopper and divider carrying frames disposed vertically therein, antifriction-bearings on which said frames are supported and guided at one end, suitable guides engaging the frames at their opposite ends and preserving their parallelism, and means for imparting edgewise or lateral movements to said frames on their supports simultaneously in opposite directions, substantially as described.

5. An ore-sampling machine, comprising in combination an upright supporting-frame, a pair of vertical frames mounted side by side so as to be capable of lateral reciprocation within said supporting-frame, a series of hoppers and dividers fixedly secured in said vertical frames respectively and so disposed as to present a vertical series of alternate hoppers and dividers, a discharge-chute disposed in front of said series of hoppers and dividers and having those portions of its rear wall opposite the lower ends of the discharge-chambers of the dividers cut away to receive the discharge therefrom, and means for imparting to said vertical frames simultaneous lateral reciprocations in opposite directions, substantially as described.

6. An ore-sampling machine, comprising in combination an upright supporting-frame, a pair of vertical frames disposed side by side therein, each of said frames having a series of suitably-spaced cross-bars, hoppers and dividers rigidly mounted on said cross-bars in such a manner as to produce a vertical series of alternate dividers and hoppers, and means for effecting simultaneous opposite reciprocations of said frames, substantially as described.

7. An ore-sampling machine, comprising in combination an upright supporting-frame, a pair of parallel hopper and divider carrying frames disposed vertically and side by side therein, a double-crank shaft, having oppositely-disposed cranks mounted on one side of the supporting-frame, and pitmen connecting said cranks with said hopper and divider carrying frames respectively, substantially as described.

8. An ore-sampling machine, comprising in combination an upright supporting-frame having a pair of rollers journaled on each of its opposite sides near the top thereof, a pair of hopper and divider carrying frames suspended from said rollers and laterally reciprocable thereon, stationary guides in the base of the frame in which the lower ends of the frame are guided, a double-crank shaft having oppositely-disposed cranks mounted on one side of the supporting-frame, and pitmen connecting said cranks with said hopper and divider carrying frames respectively, substantially as described.

9. In an ore-sampling machine, a divider having two longitudinally-parallel chambers formed lengthwise thereof, one of said chambers being open at its lower end and the other having a wall formed across its lower end and a discharge-opening formed through its bottom within the chamber and adjacent said wall, substantially as described.

10. In an ore-sampling machine, a divider having three longitudinally-parallel chambers formed lengthwise thereof, the two side chambers being open at their lower ends and adapted to receive the ore to be discarded, and the intermediate chamber having a wall formed across its lower end and a discharge-opening formed through its bottom within the chamber adjacent said wall, said intermediate chamber being adapted to receive the sample-retaining portion of the ore, substantially as described.

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