(No Model.) 4 Sheets—Sheet 1.

G. D. POTTER.

ORE SAMPLING MACHINERY.

No. 523,731. Patented July 31, 1894.

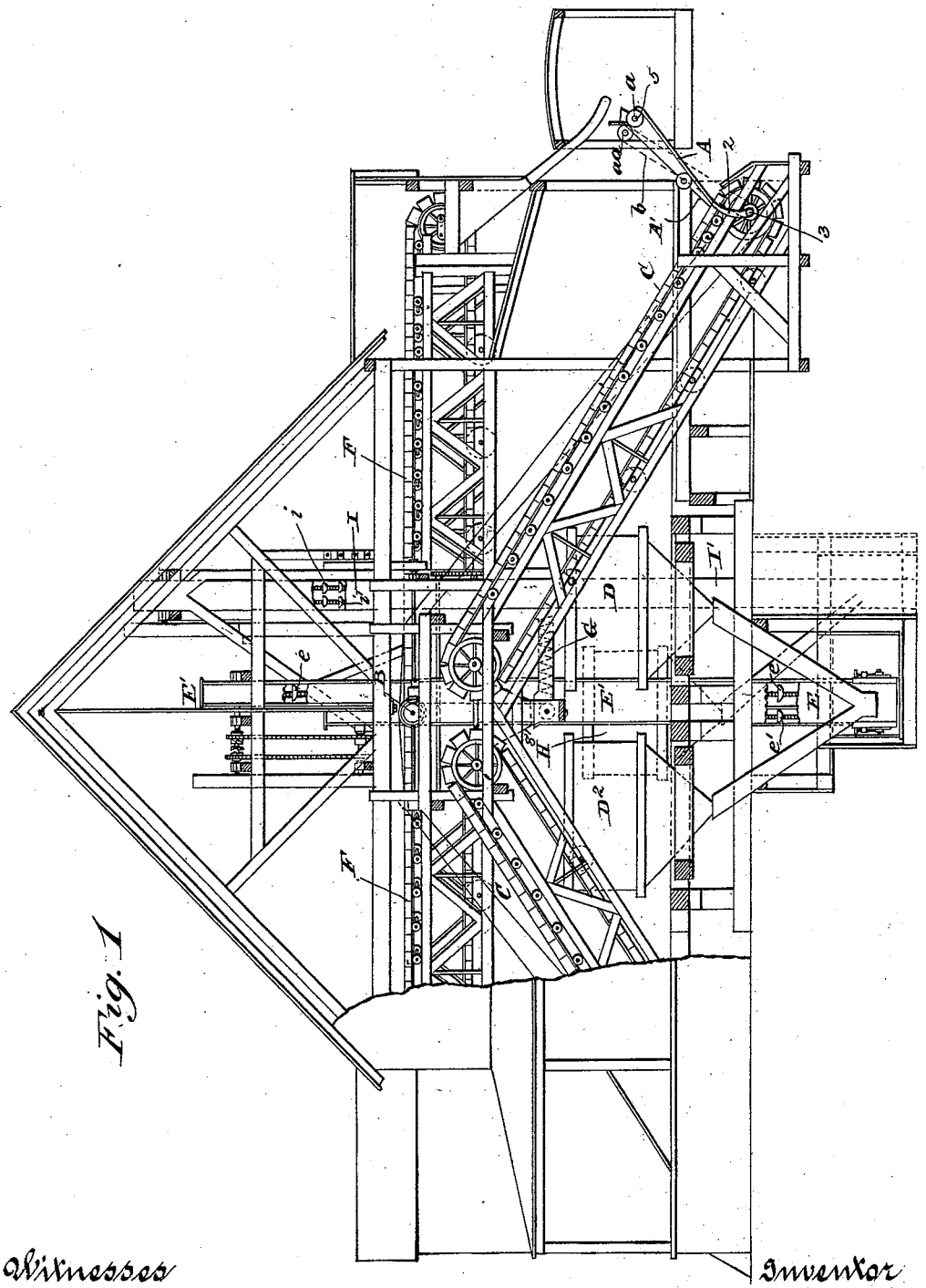

Fig. 1.

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(No Model.) 4 Sheets—Sheet 2.

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ORE SAMPLING MACHINERY.

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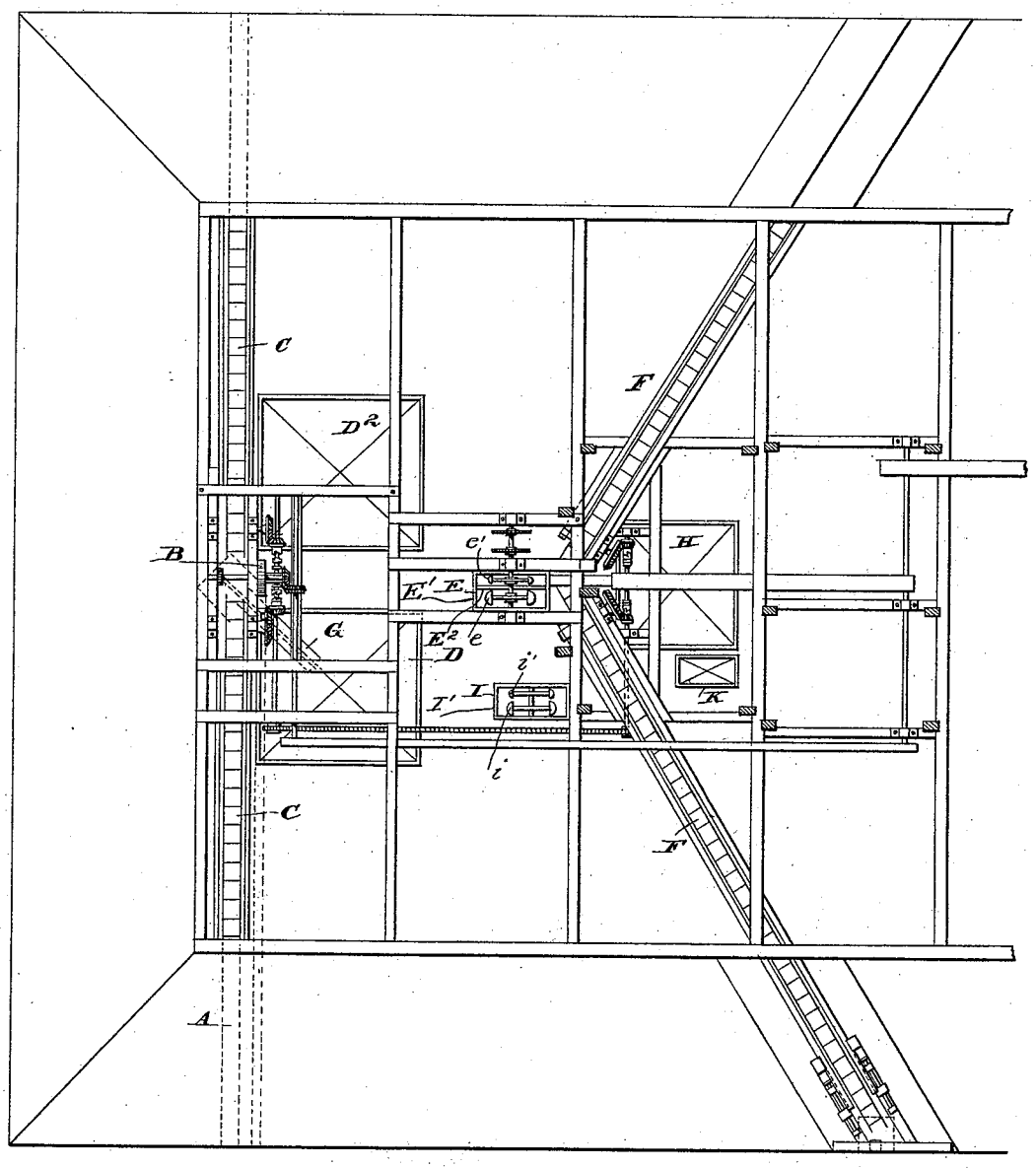
Fig. 2



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(No Model.) 4 Sheets—Sheet 3.

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ORE SAMPLING MACHINERY.

No. 523,731. Patented July 31, 1894.

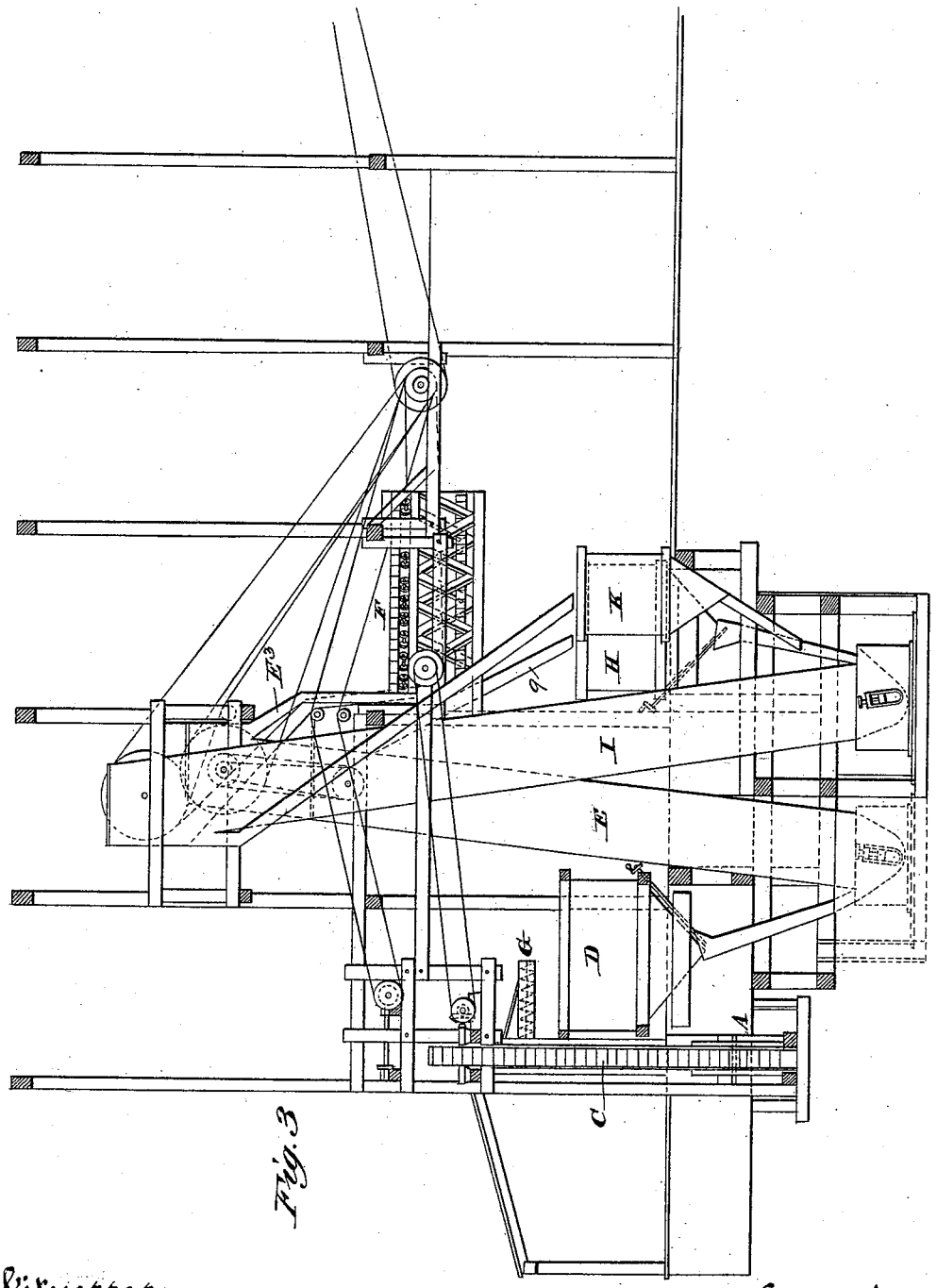

Fig. 3

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(No Model.) 4 Sheets—Sheet 4.

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ORE SAMPLING MACHINERY.

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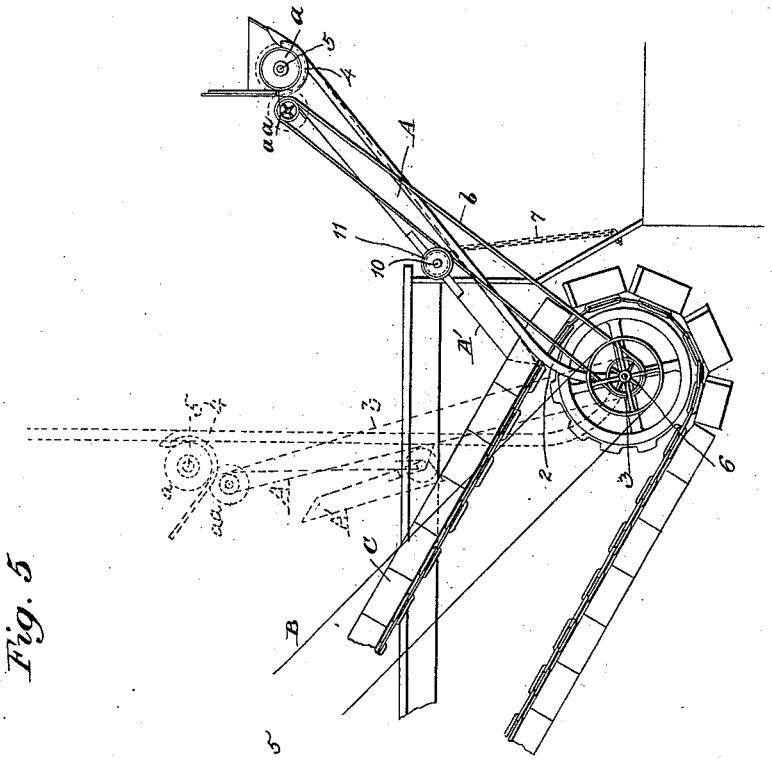

Fig. 5

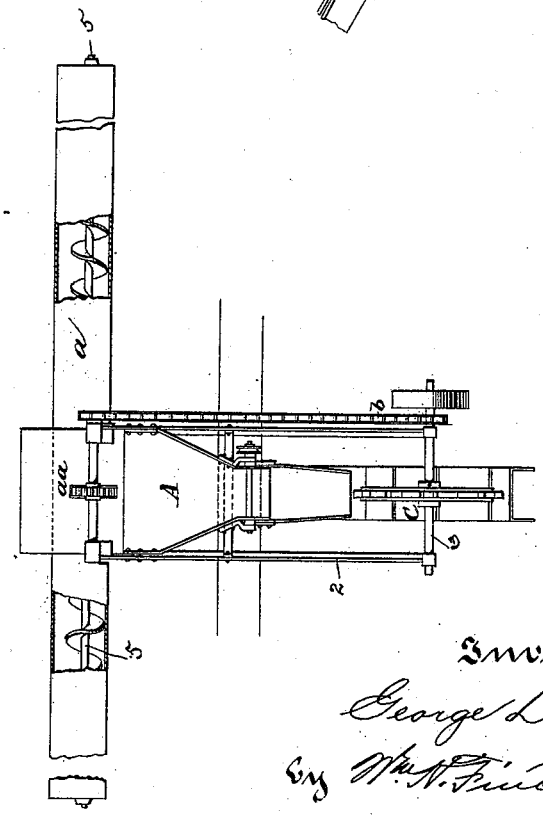

Fig. 4

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UNITED STATES PATENT OFFICE.

GEORGE D. POTTER, OF WALLACE, IDAHO, ASSIGNOR OF FIVE-EIGHTHS TO CHARLES M. WHITLAW, OF SAME PLACE, AND ERNEST C. ARNOLDI, OF SPOKANE, WASHINGTON.

ORE-SAMPLING MACHINERY.

SPECIFICATION forming part of Letters Patent No. 523,731, dated July 31, 1894.

Application filed March 14, 1893. Serial No. 465,906. (No model.)

To all whom it may concern:

Be it known that I, GEORGE D. POTTER, a citizen of the United States, residing at Wallace, in the county of Shoshone and State of Idaho, have invented a new and useful Improvement in Ore-Sampling Machinery, of which the following is a full, clear, and exact description.

My invention relates to means for automatically sampling precious and base ores; and the object of my invention is to obtain from a large quantity of ore or concentrates a small average sample, which, when assayed in the usual way, shall show the amount or per centage of metal contained in the whole. In order to attain this object, it is necessary that the exact weight of the whole quantity of material as compared to the sample should be determined; and also that the sample should be composed of a number of small quantities taken at regular intervals during the handling of the ore; and it is further necessary that the samples should be taken from the lot of ore by positive means not dependent upon the action of gravity and other natural laws which would tend to cause a separation of the coarse from the fine or light and heavy particles.

Having thus stated the principle of my invention, I will proceed now to describe the best mode in which I have contemplated applying that principle, and then will particularly point out and distinctly claim the part or improvement which I claim as my invention.

In the accompanying drawings illustrating my invention, in the several figures of which like parts are similarly designated, Figure 1 is an elevation of the entire plant. Fig. 2 is a plan view of the same. Fig. 3 is a longitudinal section of the same. Fig. 4 is a front elevation, partly broken out, of the unloading mechanism; and Fig. 5 is a side elevation of the said unloading mechanism.

The building and machinery contained therein and constituting the plant for sampling ores, is commonly referred to as a mill. I have shown in the accompanying drawings a building of suitable construction to receive the mechanism hereinafter more particularly described, which constitutes my invention, and I have also shown this mechanism duplicated to such an extent as to enable the mill to work from cars arranged upon opposite sides thereof in order to facilitate the sampling of ores in large quantities.

The building itself, not forming any essential part of my invention herein, is not described in detail.

The duplication of the mechanism for sampling purposes will appear in detail in the following description.

The letter A designates an unloading chute, provided with arms 2, pivoted to the shaft 3, which is mounted in suitable bearings. This chute A is provided with a saddle 4, in which is arranged a portable right and left hand screw conveyer *a*,—see details in Figs. 4 and 5.

a a, is a gear wheel meshing with a pinion on the shaft 5 of the right and left hand screw conveyer *a* to drive it, and the said gear wheel is driven by a belt *b* from a pulley 6 on the shaft 3, which shaft may be driven in any suitable manner, as by belt B and its pulley and the motion thereof transmitted to pulley 6.

The unloading chute A is provided with a hinged portion or apron A′, and, as above stated, the said chute is pivoted to the shaft 3 in such a manner that the said chute, with its conveyer *a* removed, may be folded up and swung back into the dotted-line position shown in Fig. 5, when not in use.

Apron A′ is attached to a shaft 10 forming the core of the hinge which couples said apron to chute A. On one end of this shaft is a grooved pulley 11 around which a chain 7 is wound and the end of the chain is attached to this pulley. The other end of the chain is anchored at a point under and slightly forward of the said pulley. When chute A begins to move back, swinging on its arms 2, the traction of the chain on pulley 11 revolves it to the right (as shown in drawings) and with it the shaft to which the folding apron A′ is attached so that when the chute has assumed the position shown in dotted lines the apron A′ is folded up against chute A as shown. The unloading chute A opens into a conveyer C, which is made as an open-trough chain or belt conveyer, such as are in com-

mon use, and inclined from the horizontal sufficient to elevate the ore, but not so steep as to cause the ore to slide or roll back. This conveyer C extends to a hopper 8. It is necessary that the apron A′ be folded up, otherwise it would be driven down into the bottom of conveyer C and prevent the folding back of the main chute A.

D, D² are hopper scales of any usual or approved pattern, of sufficient capacity to hold and weigh a carload of ore each.

E is an elevator arranged in a leg E′, and this leg is provided, near its top, with a partition E². This leg is provided at top and bottom with suitable shafts and pulleys or drums, and appropriate driving mechanism therefor, on which pulleys or drums are arranged the two endless bucket elevators *e*, *e′*. The leg E′ is shown in Fig. 1 as shorter on the side containing the elevator *e′* than it is on the side containing the elevator *e*, because the elevator *e′*, as will presently appear, discharges at a lower level than the elevator *e*. These two elevators *e* and *e′* constitute what I term a double elevator, and these two elevators are arranged to take different quantities in definite proportions; as, for instance, one may have five or ten times the capacity of the other, according to the speed at which the sample side of the elevator is driven. The elevator is provided with a spout E³, which receives the ore elevated by the main side of the elevator and which discharges into an endless open-trough conveyer F, running diagonally from the said spout to a point at the side of the building, one car length from the unloading conveyer C, and said elevator is also provided with a spout 9 which receives the ore from the sample elevator and discharges it into the sample hopper.

The hopper 8 is provided with a swinging spout G, mounted on the principle of a crane, and arranged immediately under the discharge of the inclined conveyer C, and swinging over the respective centers of the hoppers D, D².

H is another hopper scale, which is conveniently placed to receive the sample from the elevator E.

I is a smaller double elevator, of the same general style as the double elevator E; that is to say, it is composed of a leg I′, containing at top and bottom suitable shafts provided with pulleys or drums, upon which are mounted the elevators *i*, *i′*, of different relative capacity; that is to say, these elevators are designed to take up twice as much ore on one side as is taken up by the other side.

K is a double compartment auxiliary hopper or hopper-scale into either compartment of which the sample is alternately delivered from the elevator I.

The drawings fully indicate the gearing by which power is applied to these various elevators and conveyers, and no further description thereof is deemed necessary.

As shown more particularly in Figs. 1 and 2, the conveyer C is duplicated, as is, also, the conveyer F, and it will be observed that the conveyers C deposit their loads in hopper 8, which is common to both. The elevators E and I are arranged to discharge into either of the conveyers F, F.

The operation is substantially as follows: A car having been run opposite the unloading device, the unloading chute is brought down into position shown in Figs. 1 and 5, so as to project into the side door of the car, and then the screw conveyer *a* is placed in the saddle in the said unloading chute, and ore is shoveled into the said conveyer at each end or either end, and is drawn by the screw to the center, where it is discharged into the unloading chute A, down which it slides on to the inclined conveyer C, by which it is carried up to the hopper 8, and, descending thence into the spout G, (which may contain a screw conveyer, if necessary,) it, the said ore, is delivered into hopper D or D². The car having been emptied and the hopper, (say, hopper D,) filled with the car's load, the ore is weighed. The empty car is then moved down to the spout of the loading conveyer F. The gate in the bottom of the hopper D is then opened, and the ore passes through the spouts of said hopper into the boot of the elevator E, whence it is elevated jointly by the double lines of buckets, in the proportion of nine parts to the larger elevator *e*, and discharged into the horizontal conveyer F, by which it is delivered into the empty car, and one part or tenth by the other or smaller elevator *e′*, which is delivered by the spout 9 into the sample hopper H. That is to say, only that portion of the load from which it is designed ultimately to take the sample is retained in the mill, while all the rest of the load is immediately discharged from the mill back again into the car. The sample taken out and deposited in the sample hopper H by the smaller elevator *e′* is then weighed. The weight of the sample deducted from the weight of the carload shows the weight of ore returned to the car at this stage of the operation, the importance of which will be shown later on in this specification. The sample having been weighed, the sample elevator I is started and two parts of the ore from the sample hopper H are delivered on to the horizontal conveyer F by the elevator *i*, and one part or third is delivered into the auxiliary hopper K by the elevator *i′*, and the sample is re-elevated and cut down in like manner until reduced to about fifty pounds, which will represent an average of the whole carload.

Generally, in practice, ore is sampled in larger lots than one car-load, and much of the improvement in my arrangement of apparatus is especially designed to accommodate large lots, consisting, say, of five or more carloads each.

Having unloaded and weighed the first carload and placed the empty car at the loading

conveyer F, another car is moved forward to the unloading conveyer C, and while the first car is being elevated over, sampled and nine-tenths of its load returned thereto, the second car may be unloaded and conveyed to the other one of the hoppers D or D^2. The second carload having been weighed and the weight of the sample from the first car having been ascertained, the weight of this sample is taken off the scale beam of hopper D^2, and the gate in the bottom of said hopper is allowed to remain open until the scale beam turns, when a sufficient quantity of ore from the second car will have been transferred to the first car to make good the amount taken out of the same for a sample, which amount will remain in the sample hopper until the entire lot of five cars has been unloaded, weighed and sampled. In the meanwhile, the weight of the sample after each carload of ore has been elevated over, will show the amount required to complete the load in the preceding car.

In practice, ten per cent. must be added to the weight of the sample at each transfer in order to cover the amount taken out for sample while the transfer is being elevated forward.

The crane-like conveyer G will empty the car from the unloading conveyer on either side of the mill in either hopper D or D^2, and the elevator E will take ore from either hopper and deliver it to either the right or left-hand loading conveyer F. The mechanism can also be used to transfer ore from one side of the mill to the other, unloading from cars on one road and reloading (after sampling) into cars on the other road.

If desired, hopper D may be filled with one carload of ore and hopper D^2 with another carload, and by opening the gates in the bottoms of both hoppers the two lots will fall into the elevator together and be mixed together and sampled at the same time. This is often done in cases where different cars are loaded with ores containing different percentages, say of lead, for the purpose of reducing freight charges. For example, freight to a given point may be ten dollars per ton on ore containing, say, thirty-five per cent. of lead, and fifteen dollars per ton on ore running over forty per cent. of lead. Now, by mixing the two carloads of ore, of these differences of percentage, a product is obtained which will take the low rate and effect a saving of two dollars and fifty cents per ton on the combined lot of two cars.

To avoid misapprehension as to the purpose of using the duplicate mechanism, as shown, I repeat that, by means of such duplicate mechanism ore can be unloaded from either side of the mill into either hopper scale and reloaded into the cars on either side, as desired, but, of course, the unloading cannot be effected from opposite sides at the same time.

An important advantage to my sampling machinery is that sampling and elevating back to the car are coincident; that is to say, ninety per cent., say, is returned directly to the car at the first elevation, whereas in all other sampling machines to me known, the ore has to be elevated, dropped through the sampler and re-elevated for re-loading into the car.

What I claim is—

1. A machine for sampling ores comprising a right and left-hand screw-conveyer, a swinging chute into which the conveyer discharges, a hopper, and a conveyer leading from the chute to the hopper, combined and arranged substantially as described, to admit of the screw-conveyer being inserted into a loaded car to discharge its contents, the said screw-conveyer also serving to mix, disintegrate and rearrange the matter in transit, in combination with an apportioning elevator, a sampling hopper, a return conveyer, into which sampling hopper and return conveyer the apportioning elevator divides its load, depositing a sample in the sampling hopper and returning through the return conveyer the balance to the car, and also a sample elevator and an auxiliary hopper into which and the return conveyer the said sample elevator in like manner divides its load, as set forth.

2. A machine for sampling ores comprising a screw-conveyer, a swinging chute into which the former discharges, a hopper and a conveyer leading from the chute to the hopper, combined and arranged substantially as described, to admit of the screw-conveyer being placed in a loaded car to discharge its contents into the hopper, in combination with an apportioning elevator, a sampling hopper, a return conveyer, into which sampling hopper and return conveyer the apportioning elevator divides its load, depositing a sample in the sampling hopper and returning through the return conveyer the balance to the car, and also a sample elevator and an auxiliary hopper into which and the return conveyer the said sample elevator in like manner divides its load, as set forth.

3. A machine for sampling ores, comprising a screw-conveyer, a swinging chute into which the former discharges, a hopper and a conveyer leading from the chute to the hopper, combined and arranged substantially as described, to admit of the screw-conveyer being placed in a loaded car to discharge its contents into the hopper, in combination with an apportioning elevator having a double line of buckets, the buckets of one line being of a proportionally greater capacity than those of the other, a sampling hopper, and a return conveyer, into which hopper and conveyer the apportioning elevator divides its load, as set forth.

4. A machine for sampling ores, comprising a screw-conveyer, a swinging chute into which the former discharges, a hopper and a conveyer leading from the chute to the hopper, combined and arranged substantially as de-

scribed, to admit of the screw-conveyer being placed in a loaded car to discharge its contents into the hopper, in combination with an apportioning elevator having a double line of buckets, the buckets of one line being of a proportionately greater capacity than those of the other, a sampling hopper, and a return conveyer, into which hopper and conveyer the apportioning elevator divides its load, and also a sample elevator having a double line of buckets, the buckets of one line having a proportionally greater capacity than those of the other, and an auxiliary hopper into which and the return conveyer the said sample elevator divides its load, whereby is insured the positive separation at regular intervals of a given quantity of the matter under treatment, independently of the action of gravity and other influences tending to impair accuracy of sampling, as set forth.

5. In a sampling apparatus, means for unloading a car, and a receiving hopper, in combination with an apportioning elevator having a double line of buckets, the buckets of one line being of a proportionately greater capacity than those of the other, a sampling hopper, and a return conveyer, into which hopper and conveyer the apportioning elevator divides its load, and also a sample elevator having a double line of buckets, the buckets of one line having a proportionally greater capacity than those of the other, and an auxiliary hopper into which and the return conveyer the said sample elevator divides its load, whereby is insured the positive separation at regular intervals of a given quantity of the matter under treatment, independently of the action of gravity and other influences tending to impair accuracy of sampling, as set forth.

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