(No Model.)

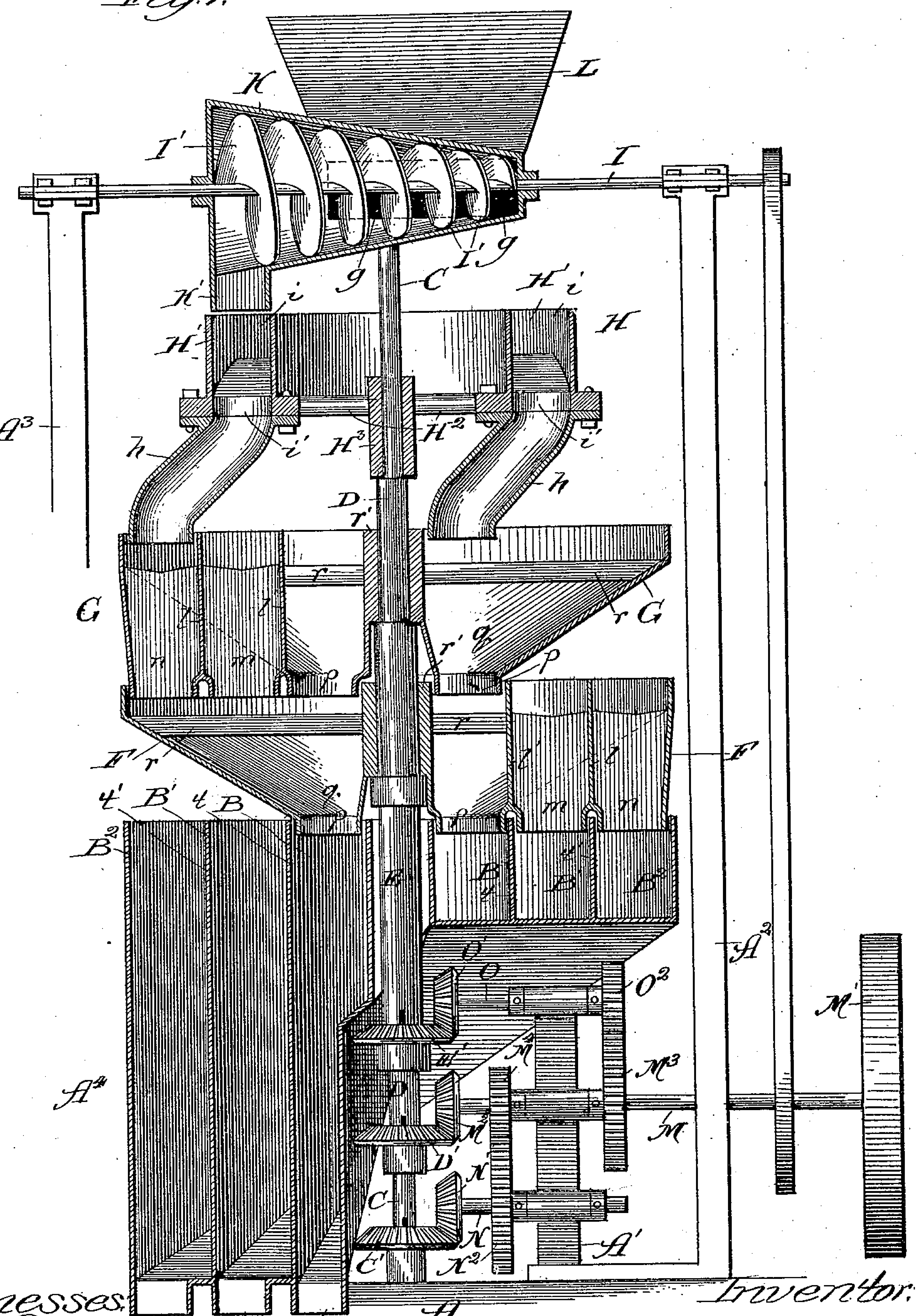
2 Sheets—Sheet 1.

H. L. BRIDGMAN.

ORE SAMPLING MACHINE.

No. 457,145. Patented Aug. 4, 1891.

Fig. 1.



Witnesses:
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Inventor:
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Att'ys.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

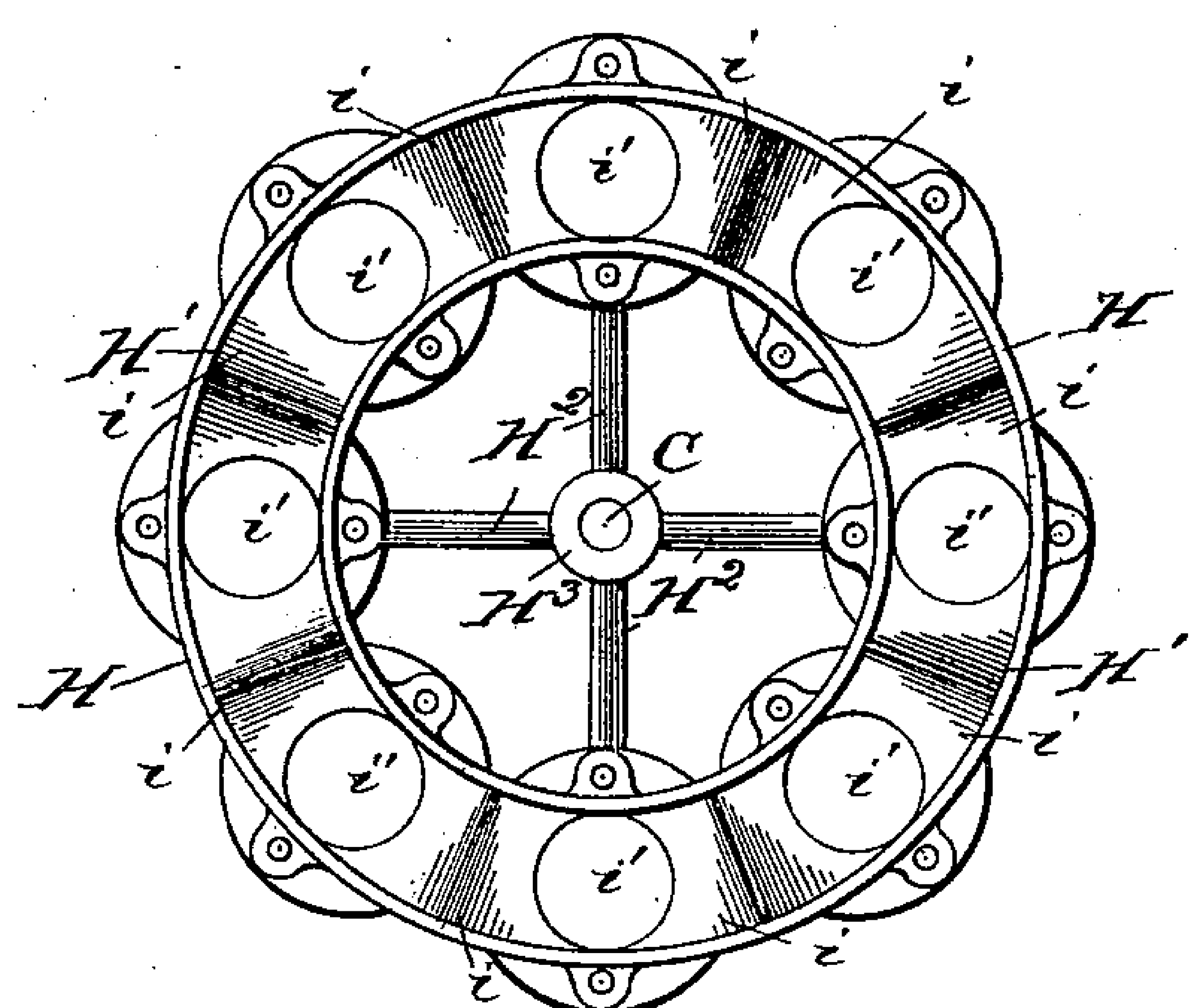
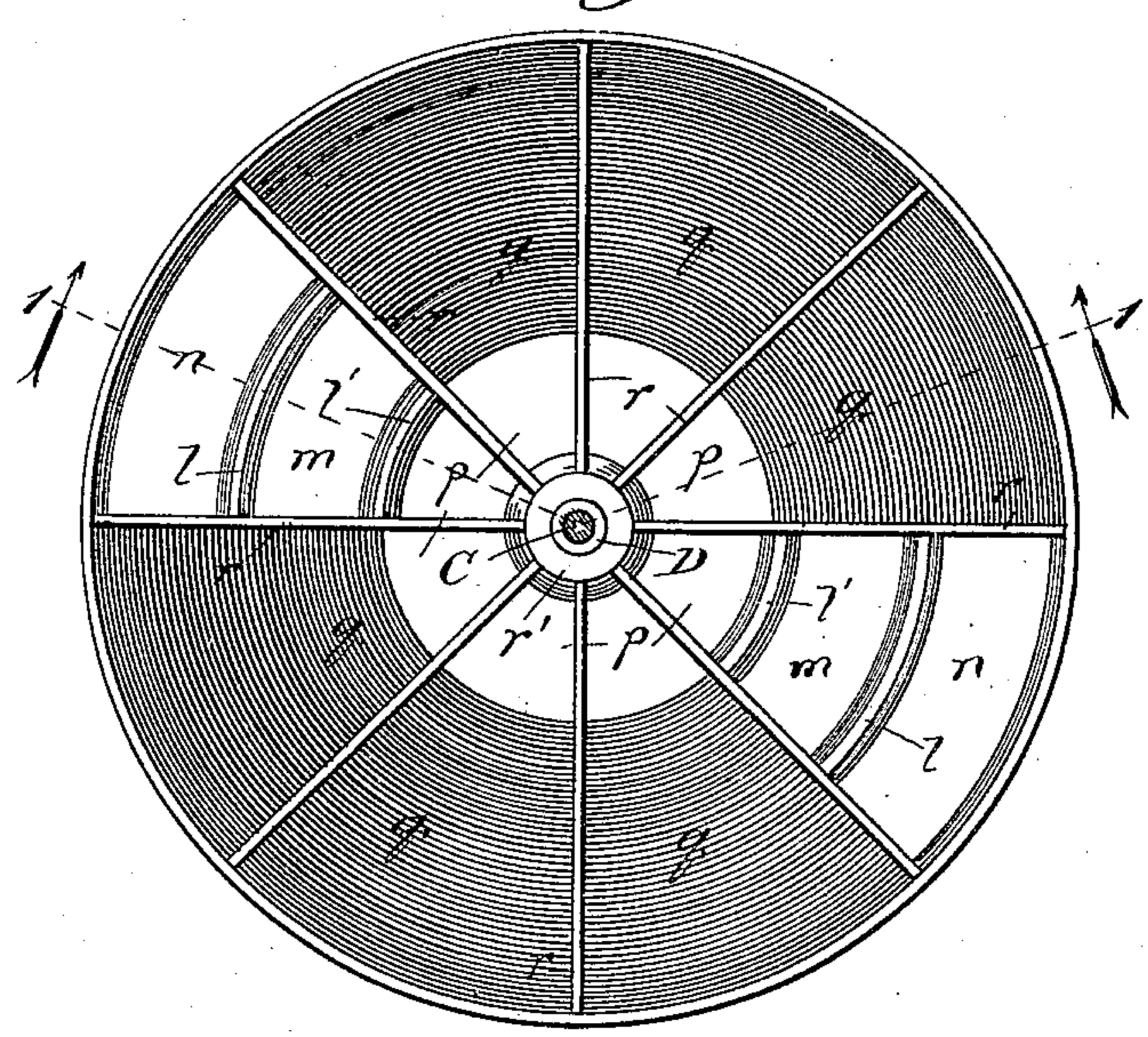


Fig. 3.



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UNITED STATES PATENT OFFICE.

HENRY L. BRIDGMAN, OF BLUE ISLAND, ILLINOIS.

ORE-SAMPLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 457,145, dated August 4, 1891.

Application filed September 16, 1890. Serial No. 365,128. (No model.)

To all whom it may concern:

Be it known that I, HENRY L. BRIDGMAN, a citizen of the United States, residing at Blue Island, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Ore-Sampling Machines, of which the following is a specification.

My object is to provide an ore-sampling machine of an improved construction for employment where samples of large masses of ore are to be obtained and by the use of which one or more conveniently small and reliable samples (as of a car-load) of ore may be set apart by causing the mass to pass but once through the machine.

In the drawings, Figure 1 is a view in vertical sectional elevation of my improved sampling-machine, the section being taken on a line indicated at 1 1 in Fig. 3 and viewed in the direction of the arrows; and Figs. 2 and 3, top plan views of details of the construction.

The stationary parts of the machine comprise a base A, standards A′, A^2, and A^3, and a collecting device A^4, comprising three concentric guide-chutes or collectors B, B′, and B^2. Extending vertically upward from the base and centrally of the concentric chutes is a rotary shaft C, provided with a beveled gear-wheel C′. Loosely surrounding the shaft C and extending the greater part of the length of the latter is an independently-rotary sleeve D, provided with a beveled gear-wheel D′, and loosely surrounding the sleeve D is a shorter and independently-rotary sleeve E, provided with a beveled gear-wheel E′. The standard A′ operates as a support for three rotary shafts M, N, and O. Upon the outer end of the shaft M is a drive-pulley M′ and at its inner end a beveled gear-wheel M^2, which meshes with the wheel D′. Between the wheels M′ and M^2 and upon the shaft M, at opposite sides of the standard A′, respectively, are a cog-wheel M^3 and pinion M^4. The shaft N is provided at its inner end with a beveled gear-wheel N′ in mesh with the wheel C′, and with a cog-wheel N^2 in mesh with the pinion M^4, and the shaft O carries a beveled gear-wheel O′, engaging the wheel E′, and a pinion O^2, engaging the cog-wheel M^3.

Fixed to the sleeve E above the guide-chutes is a rotary apportioning device F, and directly above the latter is a similar rotary apportioning device G, fixed to the sleeve D. Upon the shaft C, to rotate therewith, and above the apportioning device G is still another apportioning device H.

The guide-chutes are annular at their upper portions and are separated by partitions t and t'. They are shallow, as shown, at one side of the machine and deepen and narrow gradually toward the opposite side, where they terminate in spouts s, s', and s^2.

The apportioning device F is funnel-shaped throughout the greater part of its area, being supported and strengthened by radial arms r, which extend from the central collar r', which is keyed to the sleeve E. The device terminates at the bottom in a short annular spout p, which extends a short distance down into the chute B. At opposite sides of the spout p and in direct radial line with each other are two sets of bottomless compartments or chutes m n, the chutes of each set being separated from each other by a partition l and from the annular space over the spout p by a partition l'. The partitions and side walls of the chutes extend down to the plane of the lower end of the spout p, the lower ends of the said partitions being bifurcated, as shown, to clear the top edges of the partitions t t'. The partitions l and l' extend upward to the plane of the top of the device F, and the side walls of the chutes to a plane somewhat below the top of the latter. The two compartments or chutes m are equidistant from the center of the device and in the rotation of the latter travel the same annular path. The two compartments or chutes n are also equidistant from the center of the device and travel the same annular path. The segmental spaces between the two sets of chutes m n afford confluent chutes q, terminating in the spout p. In the device shown each chute m and n is of an area equal to one-eighth of the area of the annular path which it travels.

The apportioning device G is in construction and dimensions similar to the device F, its spout p extending into the top of the spout p of the latter, its chute m over the path of the chute m of the lower apportioner, and its chute n over the path of the chute n in the latter.

The apportioning device H comprises an

annular trough H′ upon supporting-arms H^2, radiating from the central collar H^3, which is keyed to the shaft C. The trough H′ is divided, preferably, into eight hopper-shaped compartments *i*, each terminating at the bottom in a circular outlet-opening *i′*. The trough H′ is centrally over the annular path of the chutes *m* of the device G. On the bottom of the trough, at the outlet-openings *i′*, are eight downward-projecting spouts *h*, which are adjustably secured in position, so that they may be turned to discharge into the spout *p* or paths of the chutes *m* or *n* of the device G.

In practice, to obtain the smallest samples of a mass of ore, only one of the spouts *h* would be adjusted to discharge into the path of the chutes *m* and another of the spouts *h* to discharge into the path of the chutes *n*, the remaining six spouts being adjusted to discharge into the spout *p*.

I is a horizontal rotary shaft extending across the machine above the apportioning device H and supported toward opposite ends in the standards A^2 and A^3. Upon the shaft is a spiral blade I′, smallest at one end and gradually increasing in diameter to the other end. A casing K fits closely over the spiral blade, but out of contact with it, and has a spout K′ leading from the lower part of its flaring end directly over the trough H′. Adjacent to the divergent end of the casing K and emptying into an elongate opening *g* at the side of the latter is a hopper L. The shaft I is provided with a pulley, at which it is belted to a pulley on the drive-shaft M.

When the drive-shaft is rotated, it turns the shaft I and its spiral blade and the sleeve D. Owing to its gear connection with the shafts N and O, it rotates the former and the shaft C at a reduced speed and the latter and sleeve E at an increased speed, both in a direction contrary to its own.

In operation the ore in a crushed state is fed into the hopper L, whence by the action of the spiral blade it is discharged in a uniform stream through the spout K′ into the rotating trough H′, and is distributed equally into the hoppers *i*, so that one-eighth part of the mass which falls to the trough passes out at each spout *h*. The six-eighths of the entire mass passing down through the spouts *h*, which extend over the annular spout *p* of the contrarily-rotating apportioning device G, under the arrangement above suggested fall directly through the latter and coincident spout *p* of the apportioning device F to the guide-chute B, and is discharged at the spout *s*. One-eighth portion of the mass passing down through the spout *h*, which extends over the annular path of the chute *m* of the device G, is distributed equally over the said path, one-eighth of the said eighth portion into each of the distributing-chutes *m* at opposite sides of that device, and the remaining six-eighths thereof into the confluent chutes *q*, whence it passes, with the first-discarded six-eighths, down through the spouts *p* to the chute B and out at the spout *s*. Each eighth portion of the original one-eighth which falls, as described, into the chutes *m* is distributed over the path of the chutes *m* of the apportioning device F, which, as stated, rotates in the direction contrary to the device G. One-eighth of the last-named eighth portion falls through each chute *m* of the device F to the annular guide-chute B′ and is discharged at the spout *s′*, while the remaining six-eighths of the said eighth falls to the confluent chutes *q* of that device, and is discharged with the rest of the discarded portion at the spout *s*. That eighth portion of the entire mass which passes through the spout *h*, terminating over the annular path of the chutes *n* of the device G, is distributed equally over the said path, one-eighth of the original eighth into each distributing-chute *n* and six-eighths thereof into the confluent chutes *q* to the spout *p*, to be discarded. The said two-eighths passing through the chutes *n* is distributed equally over the annular path of the chutes *n* of the apportioning device F, six-eighths thereof passing into the confluent chutes *q* and thence to the chute B and spout *s*, and the remaining two-eighths through the chutes *n* to the guide-chute B^2 and out at the spout s^2. Two approximately equal samples of the mass of ore are thus obtained—one the portion discharged at the spout *s′*, and the other that discharged at the spout s^2—each sample representing about one one-hundred-and-twenty-eighth part of the whole mass. The apportioner H is rotated across the spout K′ with a rapidity which will cause such extensive distribution of the crushed ore falling from the latter that it is very unlikely that there will exist any appreciable variation in the constituent parts of the ore discharged by the various spouts *h*. The rotation of the apportioner G in the contrary direction to the other apportioner and at an increased speed causes a very much more widespread distribution of the two-eighths first separated; and the still more rapid rotation in the contrary direction of the apportioner F makes the distribution of the parts from which the samples are obtained far more extensive than that in the apportioner G. Thus the chances of any variation in constituent parts between the first one-eighth portion and the final one-sixteenth part thereof are exceedingly remote; and if when assayed the results obtained from the two samples are found to agree, as in all likelihood they will, there can be no reasonable doubt that they are correct samples of the entire mass. In most cases an assay of only one sample would be made.

If desired, only one apportioner intermediate of the apportioner H and the collectors or guide-chutes may be employed; but while the result would be satisfactory in quality, where ore in carloads is to be sampled the samples would be larger than desired. With the machine described and spouts h directed as stated, two samples, of about one hundred and fifty-six pounds each, would be taken from a carload of twenty thousand pounds, which would be about the quantities desired. More than two apportioners F G may be employed where smaller samples are wanted or ore in larger masses is to be sampled.

I do not confine my invention to the exact construction of the apportioners or collectors, nor to the degree of division which the apportioners effect. Thus more or less than eight outlets may be provided upon the device H and more or less than one-quarter deflected, as described, by the chutes m n of the apportioners G F, and more than one spout h may, if desired, be directed over the annular paths of the chutes m and n.

The feed mechanism shown between the hopper L and trough H′, though desirable and of the preferred construction, could be dispensed with or its construction changed, as, if mechanism for the purpose is used, any construction thereof which will produce an even feed of ore to the trough may be employed.

My improved machine may be employed for obtaining samples of any other material besides ore which is susceptible of being divided by the apportioning devices in the same way.

While the rotary sampler shown and described is the construction I prefer to employ, I desire it understood that my invention is not in its broad sense to be limited to this construction, as the apportioning devices, as will readily be apparent, may partially rotate instead of wholly rotating, or may even be stationary or oscillate or reciprocate, and such a variation in the form of these particular details, when combined with the other elements as set forth in the claims, is included within the scope of my invention.

What I claim as new, and desire to secure by Letters Patent, is—

1. In an ore-sampling machine, the combination, with the feed, of apportioning mechanism below the feed operating automatically to divide from the mass as it is fed to the machine two or more samples, to subject each of those samples separately to redivision, and to discharge the ultimate samples thus obtained separately from the machine, substantially as described.

2. In an ore-sampling machine, the combination, with a feed and stationary collector below it, of two or more moving and co-operating apportioning devices between the feed and collector, substantially as described.

3. In an ore-sampler, the combination, with a feed and a stationary collector below it, of two or more rotary co-operating apportioning devices between the feed and collector, substantially as described.

4. In an ore-sampler, the combination, with the feed and stationary collectors below it, of a rotary apportioning device divided circumferentially and radially into compartments having outlets leading to the collectors, and a rotary apportioning device H above the first-named apportioning device, comprising an annular trough below the feed and having a series of outlets terminating over the compartments in the lower apportioning device, substantially as described.

5. In an ore-sampler, the combination, with a feed and a stationary collector below it, of two or more intermediate co-operating apportioning devices rotating in opposite directions, substantially as described.

6. In an ore-sampler, the combination of a feed-regulator, as the rotary spiral blade I′, stationary collectors below the said regulator, and two or more intermediate co-operating apportioning devices, substantially as described.

7. In an ore-sampler, the combination, with the feed, of a rotary apportioning device H, having an annular trough H′ below the feed, provided with outlet-openings i', an apportioning device below and rotating in a direction contrary to the device H, and provided with outlets at varying distances from its center, and describing in the rotation of the said lower device concentric circles, a series of spouts h, extending from the openings i' and terminating, respectively, in concentric planes over the paths of the outlets in the said lower device, and annular concentric collectors below the paths of the outlets in the said lower apportioning device, substantially as described.

8. In an ore-sampler, the combination, with the feed, of a rotary apportioning device H, having an annular trough H′ below the feed, provided with outlet-openings i', an apportioning device below and rotating in a direction contrary to the device H and divided circumferentially and radially into compartments q, n, and m, the compartments m and n rotating in planes concentric with each other, and all the compartments having outlets describing in the rotation of the lower said device circles concentric with each other, a series of spouts h, extending from the openings i' and terminating, respectively, in concentric planes over the paths of the compartments in the lower said device, and annular concentric collectors below the paths of the outlets of said compartments, substantially as described.

9. In an ore-sampler, the combination, with the feed, of a rotary apportioning device H, having an annular trough H′ below the feed and divided into a series of hopper-shaped compartments i, having outlets i', an apportioning device below and rotating in a direction contrary to the device H and provided with outlets at varying distances from its center, and describing in the rotation of the said lower device concentric circles, a series of spouts h, extending from the openings i' and terminating, respectively, in concentric planes over the paths of the outlets in the

said lower device, and annular concentric collectors below the paths of the outlets in the said lower apportioning device, substantially as described.

10. In an ore-sampler, the combination of the co-operating apportioning devices H and F, rotating in the same direction, and intermediate co-operating apportioning device G, rotating in the contrary direction, and stationary collector A^4 below the device G, substantially as described.

HENRY L. BRIDGMAN.

In presence of—
J. W. DYRENFORTH,
M. J. FROST.