

No. 626,173.

Patented May 30, 1899.

M. F. LEECH.  
APPARATUS FOR TREATING ORES.

(Application filed Mar. 4, 1898.)

(No Model.)

Fig. 1.

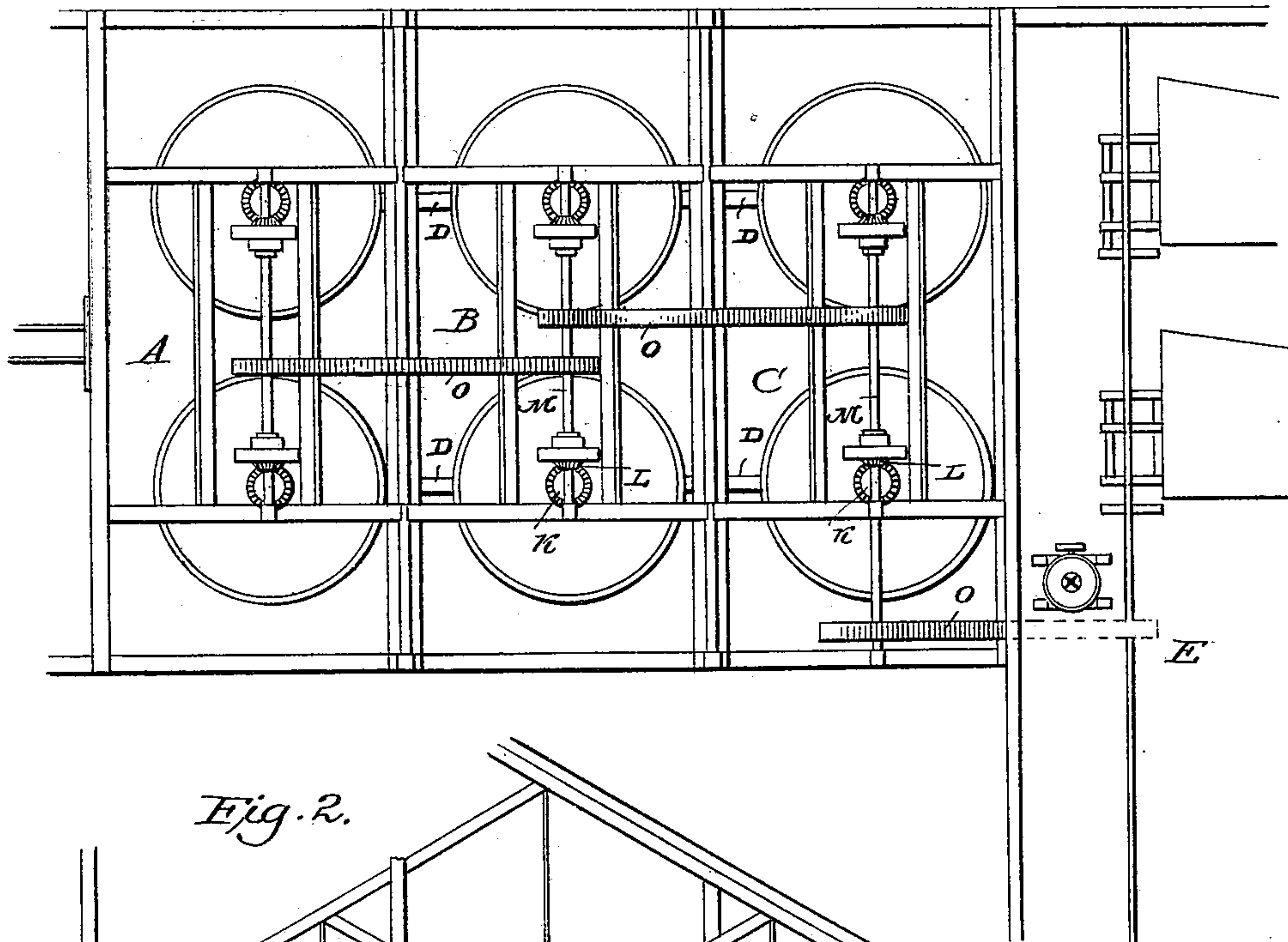
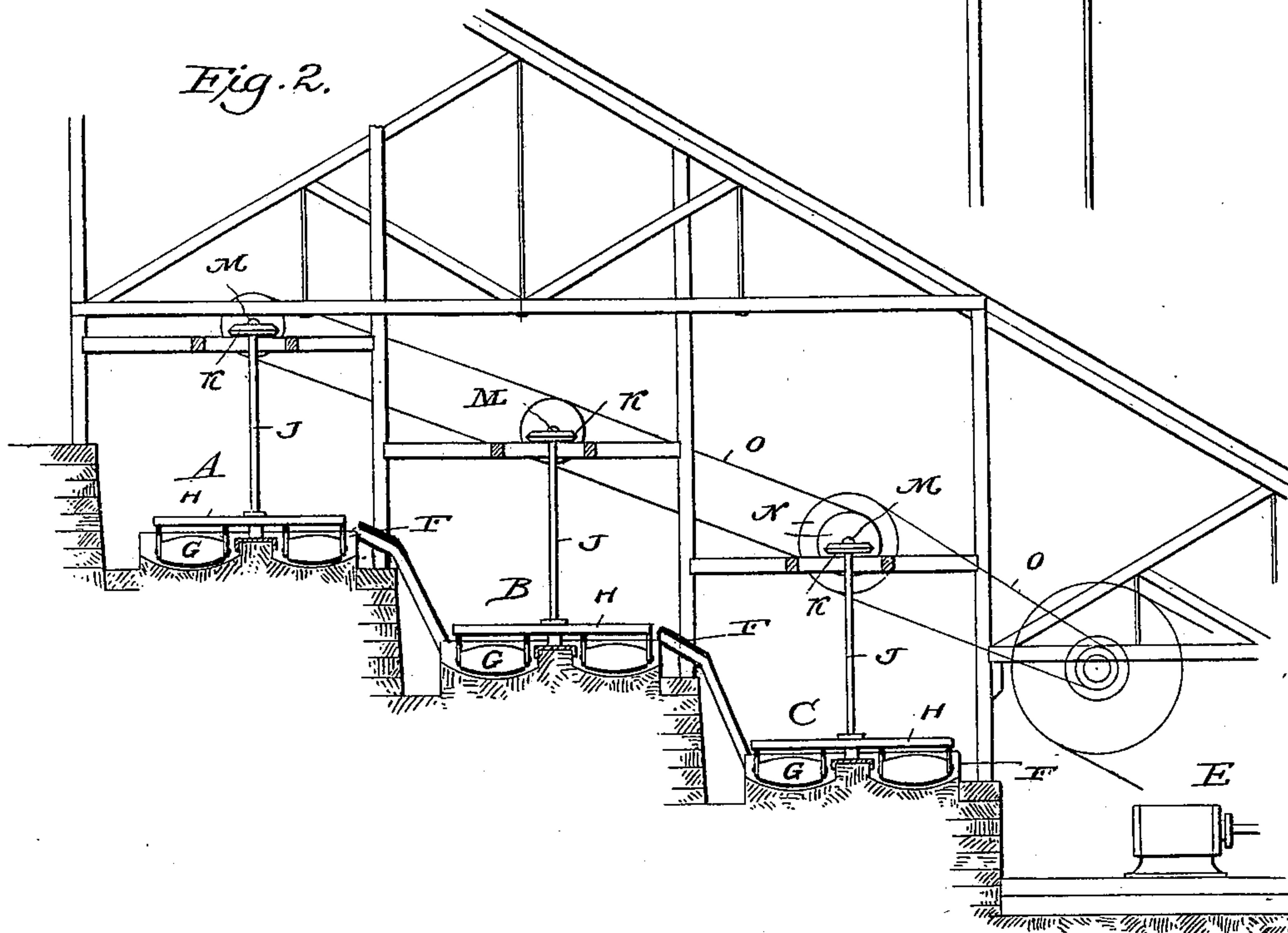


Fig. 2.



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Inventor:

MILLARD F. LEECH,

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# UNITED STATES PATENT OFFICE.

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## APPARATUS FOR TREATING ORES.

SPECIFICATION forming part of Letters Patent No. 626,173, dated May 30, 1899.

Application filed March 4, 1898. Serial No. 672,579. (No model.)

*To all whom it may concern:*

Be it known that I, MILLARD F. LEECH, a citizen of the United States of America, and a resident of Boulder, in the county of Boulder and State of Colorado, have invented certain new and useful Improvements in Apparatus for Treating Ores, of which the following is a specification.

My invention relates to an improved apparatus for the treatment of gold and silver ores; and the leading object of my invention is the provision of an apparatus for treating ores by means of which the amalgamation may be effected in a more rapid and perfect manner and also by means of which more compactness, simplicity, and cheapness in the operation and apparatus may be assured.

Another object of my invention is to greatly enlarge the capacity for treating ores, of pulverizing them in a more thorough manner, and of continuing the operation without emptying each separate arrastre, as has always been the custom.

To attain the desired objects, the invention, broadly stated, consists of an apparatus embodying a series of arrastres communicating and arranged in sets one above the other, whereby the fine pulverized ore from the upper set will flow to the next set, and so on through the entire series of the apparatus for the purpose of amalgamation and preparation of the pulp for concentration or other methods of extracting the values from the ore.

In order that my improved apparatus may be fully understood and its advantages be appreciated, I have illustrated in the accompanying drawings a form of mill or apparatus constructed in accordance with and embodying my invention, in which—

Figure 1 represents a top plan view of the apparatus, and Fig. 2 represents a side elevation thereof.

It will of course be understood that by the term "arrastres" is meant the mill so long in use among Spanish-Americans, which consists, essentially, of a circular pan or inclosure, a central post or pivot from which extend traveling radial arms or other supports, and drag stones or rollers movably connected to said arms and resting freely upon the layer of ma-

terial and crushing it principally by their weight as they are dragged around at a low rate of speed. The effect of this is that the mill is self-adjusting and that while the drag-stones or crushing appliances ride high over the coarsest fragments in the first set of arrastres, and thus miss the smaller fragments which do not project upward so far, the stones adjust themselves lower to the reduced material in each successive arrastre as it receives from the set above.

In the drawings, A designates the upper set of arrastres. B designates the next set. C designates the next set of arrastres, being connected by conduits D, and E designates the mechanism for driving or operating the arrastres. It will thus be seen that in my apparatus the series of arrastres are arranged in tiers, sets, or benches and after the manner of steps.

The arrastres, as shown, are built of masonry to form the circular inclosure F, in which revolve the drag-stones or drag appliances G, which are carried by the radial arms or supports H, connected to the vertical shaft J, each carrying a bevel-gear K, meshing with bevel-gears L on horizontal shafts M, carrying pulleys N, driven from the driving source E (in this instance an engine) through the medium of belt connections O.

In operation the large fragments are fed to the first or high set of arrastres and partially crushed therein, the overflow passing through the conduits to the next sets, where a further reduction occurs, and so on through the series until the ore is fully treated in a rapid, inexpensive, and thorough manner.

It will be observed that the sets of arrastres are connected by conduits which lead from the top of one set of the arrastres to the next set below and that as the drag appliances press down upon the fragments the finer particles are forced upward and overflow through the conduits to the next set of arrastres and receive further treatment in like manner.

It will be seen that any number of sets of arrastres may be employed and that any desired driving mechanism may be used, my apparatus depending upon the stepped or in-



clined arrangement of the arrastres, whereby the pulp passes from the upper to the lower set, and thus an apparatus of great capacity is provided and more effective and rapid work is assured.

It is evident that by passing the ore from one to another of a series of two or more arrastres the capacity of a series of arrastres as shown and described is greater than if the same number of arrastres were used in the old way, whereby each arrastre finishes the pulverizing before being emptied, and it is also evident that the amalgamation of any metallic values in the ores is greatly increased by my improved system.

I claim—

1. The combination of a series of arrastres arranged in sets after the manner of steps, conduits leading from the top of one set of arrastres to the next set below, and grinding mechanism arranged in the arrastres; whereby the pressure upon the large fragments will force the finer particles to raise and pass through the overflow-conduits to the next set of arrastres below.

2. The combination of a series of arrastres placed side by side in sets and arranged in steps or inclined succession in such a manner that the material reduced by one set of arrastres will be forced upward and overflow to the next set below and receive further reduction, each arrastre consisting of an open horizontally-disposed receptacle, a radial arm or support carried by a vertical shaft, and a vertically yielding or adjustable drag-stone or drag appliance; so that each succeeding arrastre will be adjusting itself to and operat-

ing upon more and more finely reduced material.

3. The combination of a series of arrastres placed side by side in sets and arranged in steps or inclined succession, overflow-conduits leading from the top of one set of arrastres to the next set below, in such a manner that the material reduced by one set of arrastres will flow to the next set and receive further reduction, each arrastre consisting of a receptacle or inclosure, a radial arm or support carried by a vertical shaft, and a vertically yielding or adjustable drag-stone or drag appliance connected to the radial arm; whereby each succeeding arrastre will be adjusting itself to and operating on more and more finely reduced material.

4. An arrastre, consisting of an open dish or concaved receptacle, a vertical shaft having its lower end bearing in the receptacle, mechanism for revolving the shaft, a radial arm connected to said shaft, a drag-stone or drag appliance movably or adjustably connected to said radial arm, and an overflow conduit or conductor leading from the top of the receptacle; whereby the finer particles or fragments of material are ground by the drag appliances and forced up over the top of the receptacle and discharged through the overflow-conduit.

Signed by me, at Boulder, Boulder county, Colorado, this 17th day of February, 1898.

MILLARD F. LEECH.

Witnesses:

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GEO. HANSBOUGH.