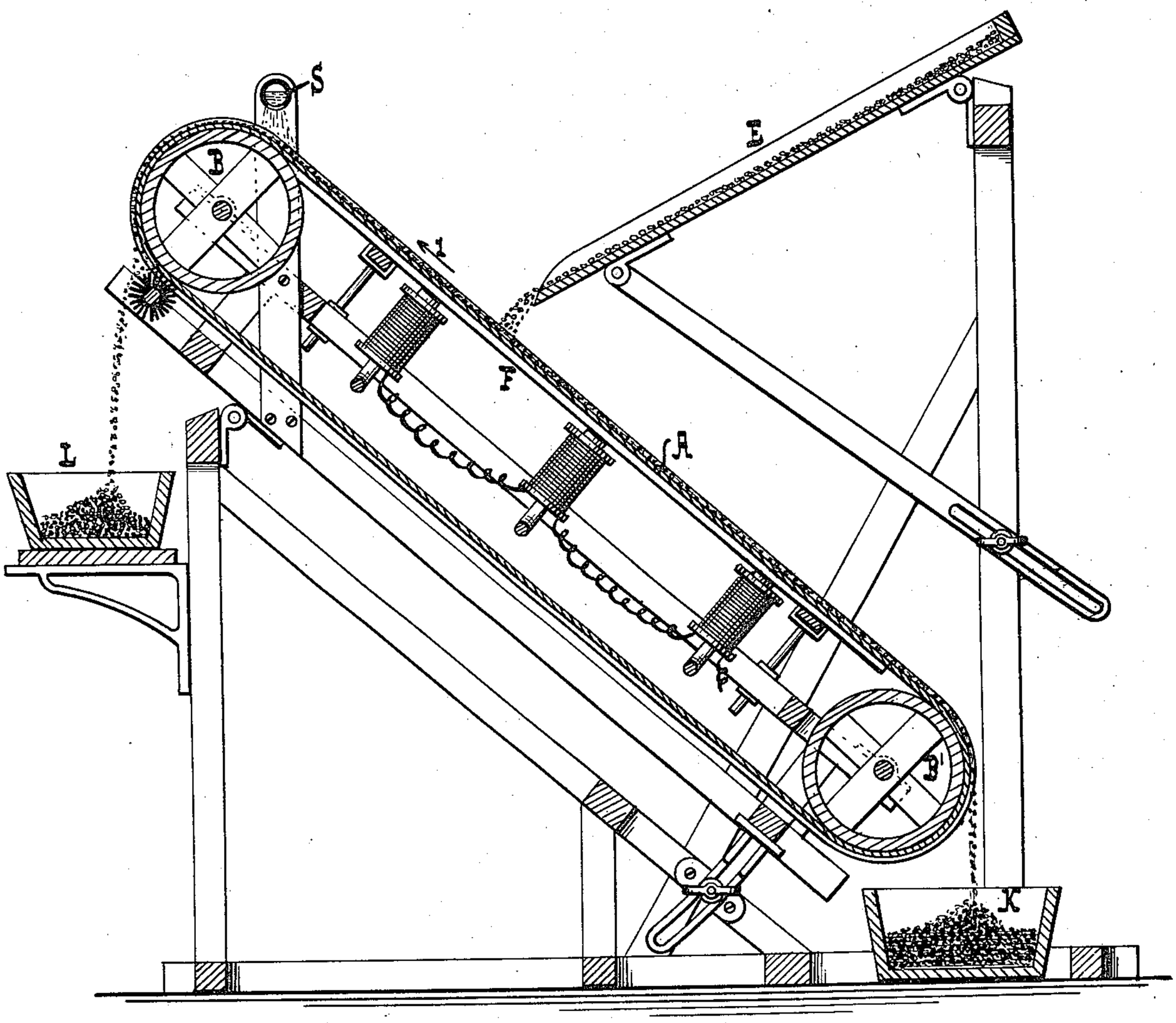
(No Model.) 2 Sheets—Sheet 1.

G. CONKLING.

PROCESS OF MAGNETICALLY CONCENTRATING ORE.

No. 441,060. Patented Nov. 18, 1890.

Fig. 1.



WITNESSES:
William Miller
Edward Wolff.

INVENTOR:
Gurdon Conkling
BY
Van Santvoord & Hauff
his ATTORNEYS

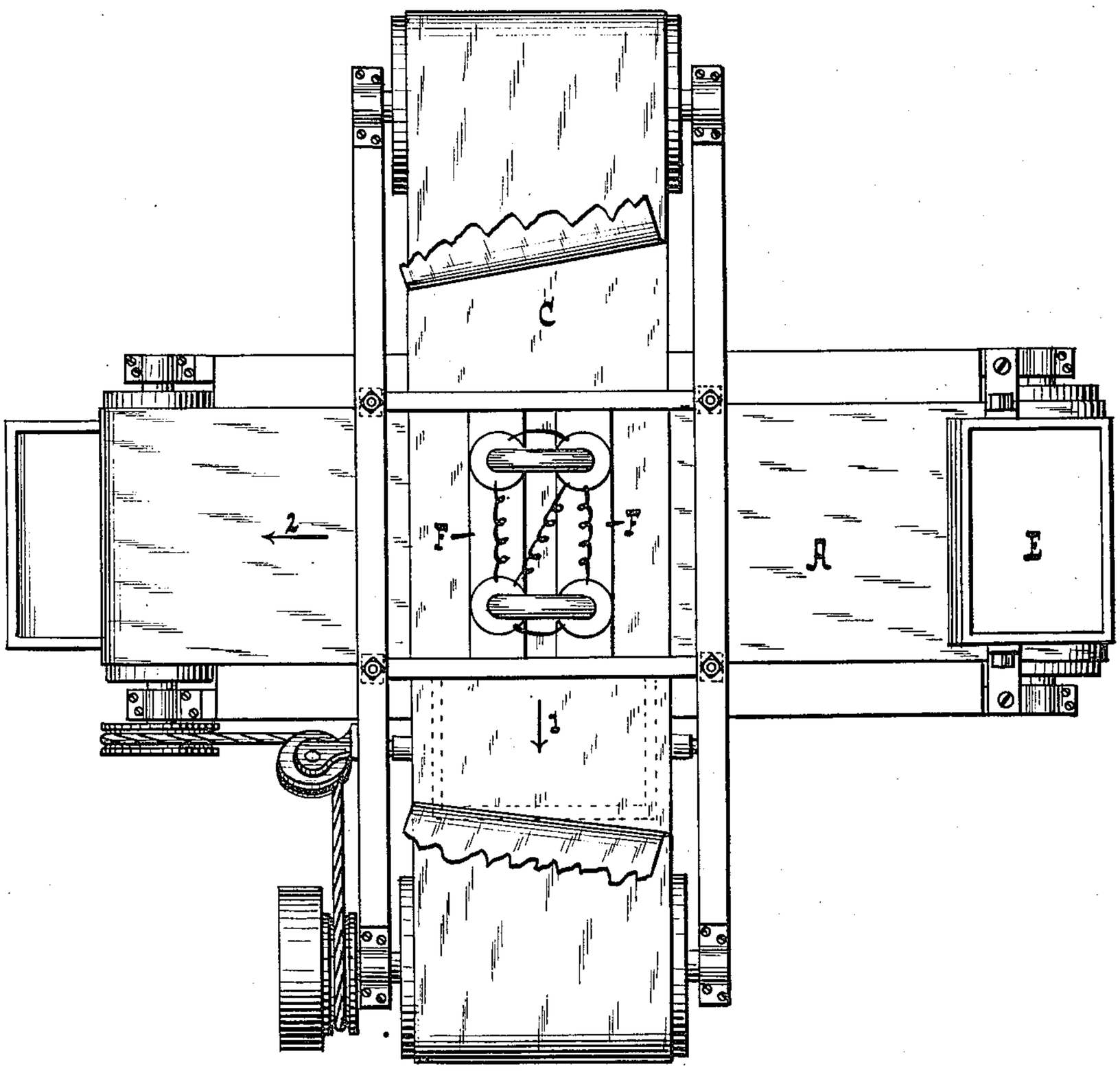
(No Model.) 2 Sheets—Sheet 2.

G. CONKLING.

PROCESS OF MAGNETICALLY CONCENTRATING ORE.

No. 441,060. Patented Nov. 18, 1890.

Fig. 2.



WITNESSES:

William Miller
Edward Wolff.

INVENTOR:

Gurdon Conkling

BY

Van Santvoord & Hauff

his ATTORNEYS

UNITED STATES PATENT OFFICE.

GURDON CONKLING, OF GLENS FALLS, NEW YORK.

PROCESS OF MAGNETICALLY CONCENTRATING ORE.

SPECIFICATION forming part of Letters Patent No. 441,060, dated November 18, 1890.

Application filed October 12, 1889. Serial No. 326,773. (No model.)

To all whom it may concern:

Be it known that I, GURDON CONKLING, a citizen of the United States, residing at Glens Falls, in the county of Warren and State of New York, have invented new and useful Improvements in the Process for Concentrating Iron Ore, of which the following is a specification.

This invention relates to a new process for concentrating ore containing iron, said process being pointed out in the following specification and claim.

The accompanying drawings represent in Figure 1 a longitudinal vertical section of a magnetic separator, which may be used in carrying out a certain part of my process; and Fig. 2 is a plan or top view of another magnetic separator, which may be used in carrying out another part of my invention.

Similar letters indicate corresponding parts.

If a man comes in possession of a mine his first question is, can I work this mine with a profit? If he finds that he can he works the mine; but if he finds that he will lose rather than profit he will let the mine lie idle.

The object of my invention is to reduce the cost of concentrating iron ore to such an extent that iron mines which heretofore could not be worked without loss can be worked with a profit.

It is a well-known fact that iron ores differ very much in their granular formation and in their richness of iron. The granular formation of some ores is such that cubes of, say, a quarter of an inch and under, contain comparatively pure ore, while with other ores the granular formation is such that the cubes formed of pure ore are equal to the twentieth or even the thirtieth part of an inch. It is also a well-known fact that the cost of crushing ore depends upon the fineness to which the ore is to be crushed; and, furthermore, the longer the crushing operation is continued the larger becomes the quantity of powdered or flowered ore produced by the crushing operation, and that this powdered ore entails a great loss in the percentage of pure ore obtained by the process of concentration. For instance, the cost of crushing iron ore to half an inch is, say, ten cents per ton, the cost of crushing the same kind of ore to a quarter of an inch is twenty cents per ton, and the cost of crushing the same to one-eighth of an inch is forty-five cents per ton, and at the same time in carrying on the crushing operation to an eighth of an inch a large quantity of powdered ore is produced, which is extremely difficult to save, and the consequence is a loss in money and in ore.

In carrying out my process with an iron ore, the granular formation of which is such that cubes of, say, a quarter of an inch and under are formed of pure ore, I proceed as follows: I first crush the ore to a quarter-inch, (such fineness being necessary, because in being crushed the lumps of ore do not split up in exact lines of the granular formation above stated,) and then I expose the crushed mass to the action of strong magnets, so that not only those fragments which consist of pure iron ore will be attracted, but also all the fragments which are composed of a large percentage of gangue and a small percentage of iron ore, and consequently the gangue which passes away as tailings in the process of concentrating contains very little iron ore.

In carrying out this part of my process an apparatus may be used such as illustrated in Fig. 1 of the drawings, in which the letter A designates the endless belt, which extends over rollers B B′ and is placed in an inclined position. F is a magnet, which is situated in the interior of the belt A close to its upper branch. E is a trough over which the crushed ore mixed with water is fed to the belt A, and S is a spray-pipe for washing the particles of ore which are attracted by the magnet. The belt moves in the direction of arrow 1, and the particles which are attracted by the magnet are carried by the belt A over the pulley B, and they are collected in the receiver L. The particles which are not attracted by the magnet run down over the pulley B′ and are collected in the receiver K. The mass which has been attracted by the magnets and collected in the receiver L is composed of particles from a quarter of an inch down, and many of the larger particles contained in this mass are composed of iron ore and gangue still attached and not having been mechanically separated in the crushing process, and in order to eliminate this gangue from the mass I submit the same to a second crushing operation, and the recrushed mass is then exposed

to the action of magnets. The mass to be treated in this second crushing operation is considerably smaller than the mass which is to be treated in the first crushing operation, and it can be crushed to, say, one-eighth of an inch in a comparatively short time; but in order to reduce the mass which is to be re-crushed still farther I select screens the meshes of which permit cubes of, say, an eighth of an inch or under to pass through, while they refuse the lumps of larger size, and I pass the entire mass from the receiver L to these screens. The coarser particles refused by the screens are then recrushed to, say, one-eighth of an inch and again submitted to the action of magnets.

From this explanation it is apparent that the bulk of the mass which has to be recrushed is much smaller than the bulk of the mass which must be treated in the first crushing operation, and if it should be attempted to crush the entire mass in the first crushing operation to an eighth of an inch the cost of the crushing process would be more than doubled, and at the same time a large quantity of powdered ore would be produced, and the consequence would be a loss in money and in iron ore, which in many cases would be fatal to the working of a mine from an economical point of view.

The operation of recrushing the particles refused by the screens can be effected in a comparatively short time, and very little, if any, powdered ore is produced, since the mass which is to be recrushed consists of particles of a quarter-inch and under, each particle containing a greater or less amount of iron ore, and the bulk of this entire mass is small—say one-eighth of the bulk of the mass which must be treated in the first crushing operation.

For the purpose of exposing the recrushed mass to the action of magnets, I can use with advantage an apparatus such as shown in Fig. 2 of the drawings. This apparatus consists of a main belt A and the secondary belt C, which extends at right angles over the main belt A, and in the interior of which, close to its lower branch, are situated the magnets F F. The mass to be separated is fed to the main belt A through the hopper E, and the magnetic particles which are attracted by the magnets F are carried away by the belt C in the direction of arrow 1, while the gangue which remains on the belt A is carried away in the direction of arrow 2.

From the foregoing example it will be readily understood that before the concentrating process is applied to a given quantity of iron ore it is first necessary to find out the largest natural granular formation of the ore in order to be able to determine the fineness to which the ore is to be crushed in the first and afterward in the second crushing operation.

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

The process of concentrating iron ore, which consists in first coarsely crushing the ore to a size required by its natural granular formation without reducing any considerable proportion of the ore to dust, then concentrating the ore by the action of magnets, then screening this concentrate to separate the richer ore, then recrushing the ore refused by the screen, and finally concentrating the recrushed ore by the action of the magnets, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

GURDON CONKLING.

Witnesses:
J. VAN SANTVOORD,
E. F. KASTENHUBER.