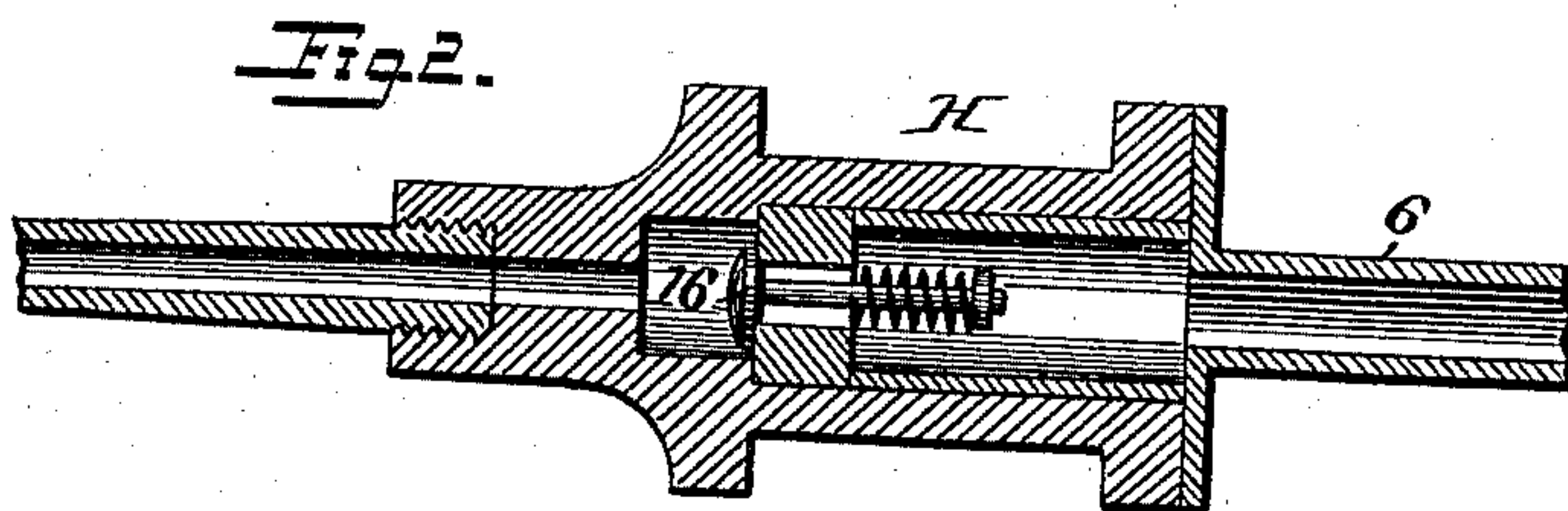
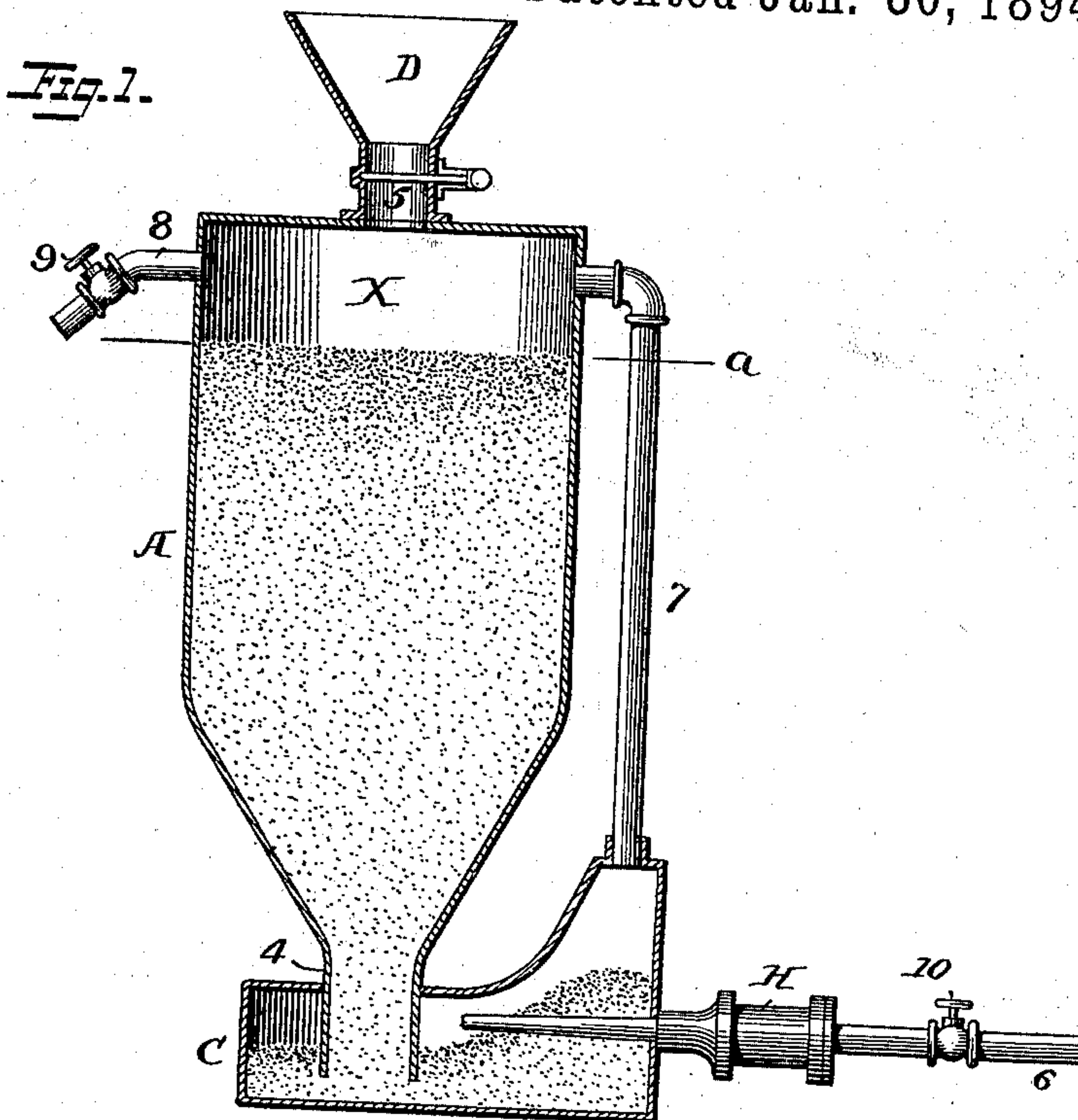


(No Model.)

M. McDONALD.
METHOD OF AND MEANS FOR SEPARATING GRANULAR MIXTURES.
No. 513,521.

Patented Jan. 30, 1894.



Witnesses
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UNITED STATES PATENT OFFICE.

MARSHALL McDONALD, OF WASHINGTON, DISTRICT OF COLUMBIA.

METHOD OF AND MEANS FOR SEPARATING GRANULAR MIXTURES.

SPECIFICATION forming part of Letters Patent No. 513,521, dated January 30, 1894.

Application filed July 25, 1892. Renewed June 28, 1893. Serial No. 479,091. (No model.)

To all whom it may concern:

Be it known that I, MARSHALL McDONALD, a citizen of the United States, and a resident of Washington, District of Columbia, have invented certain new and useful Improvements in Methods of and Means for Separating Granular Mixtures, of which the following is a specification.

My invention has for its object to separate from a body of pulverized material, particles for the purpose of grading the particles of said body, as in separating mineral substances, as ores, and to this end my invention consists in carrying a stream of water across the lower portion of the body so as to separate and lift particles from the main body and discharging the stream with the particles elevated thereby on to the top of the body, and withdrawing from the space above the top of the body, the water with the finer particles or impurities, and certain means for carrying out these operations as fully set forth hereinafter and as illustrated in the accompanying drawings, in which—

Figure 1. is a sectional elevation illustrating an apparatus embodying and carrying out my invention. Fig. 2. is an enlarged sectional detail.

The body of material to be sorted or divided according to the differences in the weight of the particles thereof is deposited in a suitable chamber, X, contained as shown in Fig. 1. in a casing A, said material being introduced from a hopper, D, by opening a valve, 5, allowing the material to pass into the casing until it is filled to about the line, *a*, Fig. 1. The bottom of the casing, A, is contracted to form a comparatively small neck, 4, which extends through the top of a shallow casing, C, and nearly to the bottom of the said casing in such position therein as to leave a chamber surrounding the neck, 4, and into this chamber, nearly in contact with the neck, 4, extends a water inlet pipe, 6. From the top of the casing, C, to the upper portion of the casing, A, extends a pipe, 7, and from the upper end of the casing, A, extends a discharge pipe, 8, having a cock, 9. The water inlet pipe, 6, is also provided with a cock, 10. After the parts are in the position shown in Fig. 1. of

the drawings and the material to be separated or divided has been introduced into the casing, A, filling all the central and lower portion of the same and extending to a certain extent into the casing, C, water is introduced so as to fill the casings and the channels, and the cock, 9, is opened and the cock, 10, is then opened to an extent sufficient to secure an injection stream through the pipe, 6, of the desired force and volume. When the particles to be removed are extremely fine and light, the force and volume of the stream through the injection pipe, 6, are proportionately small, creating thereby a current that passes round the neck, 4, laps over the surface of the material in the casing, C, and passes upward carrying with it the particles of said material through the pipe, 7, and discharges the same into the chamber, X, above the body of material and thence out through the pipe, 8, carrying with it the finer particles while the coarser particles are deposited upon the surface of the material in the casing, A. The continuance of these operations results in a gradual elimination of those fine particles which can be carried by the stream of the force secured by the proper adjustment of the cock 10, while any coarser particles that may be carried up the pipe, 7, will be deposited in the casing, A, and will not escape through the pipe, 8. There is thus a gradual feeding down of the material in the casing, A, and a washing out of the lighter particles, so that after a time every portion of the material that has been deposited in the casing, A, will be subjected to the influence of the washing current and will have the finer particles separated therefrom. After it is found that no more fine particles pass or discharge with the water passing from the pipe, 8, the force of the stream injected through the pipe, 6, may be increased and the result will be that another grade of particles is separated from the main body in like manner until no further material will pass with the water out of the discharge pipe, 8. The force of the injection stream may be then again increased and another grade of particles separated from those that have been deposited in the chamber, X. As the stream passes from the escape pipe, 8, it

may be received on to a screen of any suitable character of cloth, or felt, or wool, or fine wire so as to permit the passage of the water, but retain the particles which are afterward
5 dried and then stored for such further treatment as may be required.

It will be evident that the casing, A, and casing, C, and the arrangement of the pipes may be varied to a considerable extent without interfering with the operations herein-
10 before described.

Without limiting myself to the precise construction and arrangement of parts described for carrying out of my improvement in separating substances, I claim as my invention—
15

1. The within described method of grading the particles of a body of pulverized material, the same consisting in passing a stream of water across the lower portion of the said
20 body of material and thence upward with a portion of the material to the top of said body and discharging the water at a level above the top of the said body to carry with the water through the discharge outlet the finer particles and deposit the coarser on the top of the
25 body, substantially as set forth.

2. The within described method of grading or separating the particles of a body of pulverized material, the same consisting of passing successive streams of water differing in
30 force and volume across the material at the lower portion of the body thereof and thence upward and to the top of the said body and withdrawing the water above the said top, substantially as set forth.
35

3. The combination of a casing for contain-

ing a body of pulverized material, a second casing receiving a neck, 4, extending from the first, an injection tube arranged to inject a stream of water into the second casing, a pipe
40 extending from the second casing to the top of the first casing, and a discharge pipe extending from the top of the first casing and provided with a cock, substantially as set forth.

4. The combination of the casing, A, a casing, C, receiving a neck extending from the casing, A, a pipe extending from the casing, C, to the top of the casing, A, and a discharge
45 pipe extending from the top of the casing A, provided with a cock, and an injection pipe extending into the casing, C, and provided with a cock, substantially as set forth.

5. The combination of the casings A, and C, communicating with each other, a neck, 4,
50 surrounding the point of communication, and an injection pipe, 6, arranged to throw the injection water toward the said neck near the top of the casing, C, substantially as set forth.

6. The combination of the casing, A, casing, C, and neck, 4, extending nearly to the bottom of the casing, C, and circulating pipe, 7,
60 and inlet pipe, 6, arranged to discharge the water toward the neck, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

MARSHALL McDONALD.

Witnesses:

CHARLES E. FOSTER,
CHARLES E. GRAVES.