March 28, 1939. J. KOBOLD 2,151,855

COMPRESSOR FOR CARBON DIOXIDE SNOW

Original Filed March 12, 1935 2 Sheets-Sheet 1

Fig. 1.

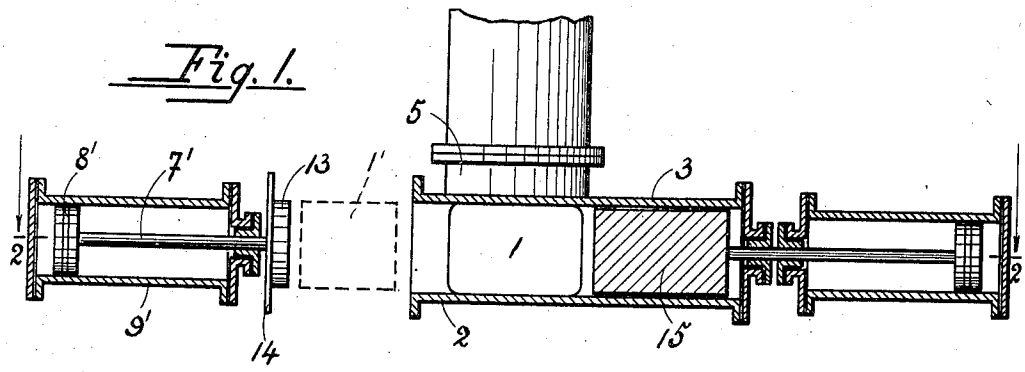

Fig. 2.

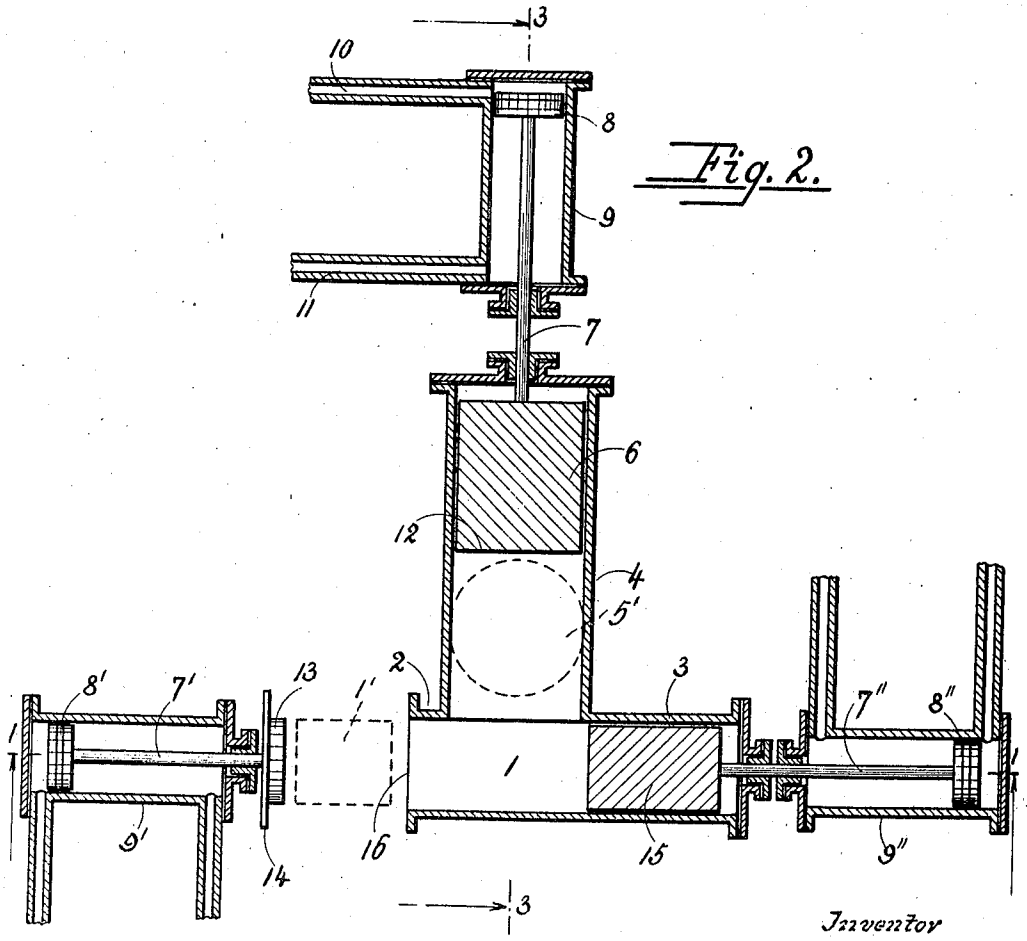

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Fig. 3.

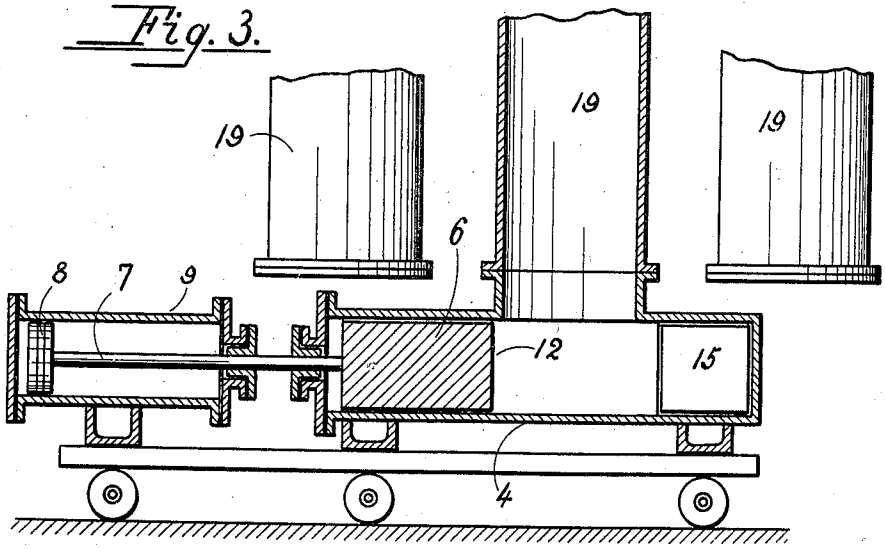
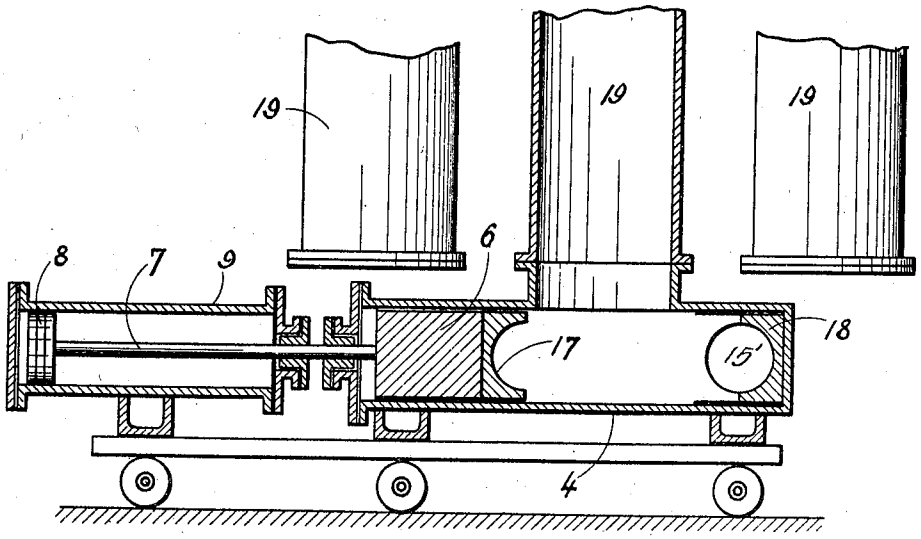


Fig. 4.



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Patented Mar. 28, 1939 2,151,855

UNITED STATES PATENT OFFICE

2,151,855

COMPRESSOR FOR CARBON DIOXIDE SNOW

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Original application March 12, 1935, Serial No. 10,610. Divided and this application September 21, 1937, Serial No. 164,916. In Germany March 23, 1934

5 Claims. (Cl. 62—121)

The present invention relates to an apparatus for compressing carbon dioxide snow into blocks of dry ice.

This case is a division of my former case Ser. No. 10,610 filed Mar. 12, 1935, now Patent No. 2,127,300, granted Aug. 16, 1938.

It is an object of the present invention to provide an apparatus for compressing carbon dioxide snow into dry ice, whereby large blocks of dry ice can be obtained, and the snow producing chambers to which the compression apparatus is connected temporarily or permanently may have any desired dimensions and can be of large capacity.

A further object of the present invention resides in the provision of an apparatus for compressing carbon dioxide snow into dry ice by means of which large blocks of dry ice of any cross sectional dimensions can be obtained and whereby the density of the ice is homogeneous over the whole block.

Another object of this invention is to provide an apparatus for compressing carbon dioxide snow into dry ice by means of which large blocks of dry ice can be made and whereby the center part of the block is prepressed, and a particularly dense core of the block is obtained.

Another object of this invention resides in the provision of an apparatus for compressing carbon dioxide snow into dry ice by means of which large blocks of dry ice of great specific weight can be obtained.

Further and other objects of the present invention will be hereinafter set forth in the accompanying specification and claims and shown in the drawings which, by way of illustration, show what I now consider to be a preferred embodiment of my invention.

In the drawings:

Fig. 1 is a part cross sectional side view of an apparatus according to my invention taken along line 1—1 in Fig. 2.

Fig. 2 is a part cross sectional top view of an apparatus according to my invention taken along line 2—2 in Fig. 1.

Fig. 3 is a part cross sectional side view of a modified apparatus according to my invention, the part shown in section being like the apparatus shown in Fig. 2 and the section being taken along line 3—3 in Fig. 2.

Fig. 4 is a part cross sectional side view of an apparatus according to my invention as shown in Fig. 3 and having provisions for making blocks of various cross sectional configurations.

Like parts are designated by like numerals in all figures of the drawings.

Referring more particularly to the drawings: 1 represents the center part of a compression chamber having lateral parts 2, 3, and 4. Parts 2 and 3 form extension chambers which are in line adjacent to and communicating with the central compression chamber 1. The central compression chamber 1 is filled with carbon dioxide snow through the charge conduit 5 which is connected to one of the lateral parts, namely, part 4 which may be termed the loading chamber. The dotted line circle 5' of Fig. 2 indicates the configuration of the mouth with which conduit 5 terminates in part 4. The width of part 4 is independent of the dimensions of the center part of the chamber or its other lateral parts and may have large cross sectional dimensions. Charge conduit 5 may be directly connected to the producer of the carbon dioxide snow or be part of the producer which, for the before stated reasons, may have large cross sectional dimensions and great capacity.

The carbon dioxide snow having a cylindrical configuration as indicated by the dotted circle 5' and entering lateral part 4 is pushed towards the center part of the compression chamber by means of piston 6, the cross section of which conforms with the interior cross section of part 4 which, in the embodiment shown, is rectangular. Piston 6 is adapted to slidably move within part 4. Piston rod 7 connects piston 6 with an operating piston 8 adapted to reciprocatingly move within operating cylinder 9 having admission and outlet openings 10 and 11 for the passage of an operating medium in and out of cylinder 9. When in the position furthest inward, i. e., closest to center part 1, the front surface 12 of piston 6 closes the opening formed by the intersection of part 4 and center part 1 and forms, together with lateral parts 2 and 3, a continuous chamber consisting of parts 2, 1, and 3. Part 2 serves chiefly for receiving the counter piston 13 which is mounted on cover 14 for closing part 2 of the compression chamber. Piston 13 and cover 14 are mounted to a piston rod 7' carrying operating piston 8' adapted to reciprocatingly move within operating cylinder 9' and to thereby operate piston 13. 15 is the compression piston proper operating in part 3 of the compression chamber. In the embodiment of the invention shown, piston 15 and chambers 1 and 3 have rectangular cross sectional configuration as indicated by the dotted rectangular outline 1'. Piston 13 may be circular or rectan-

gular. Similarly as are the other pistons, piston 15 is provided with and operated by piston rod 7'' carrying piston 8'' operating in cylinder 9''. The snow is first pushed into center part 1 by means of piston 6 and then further compressed by piston 15, while piston 13 either stands still and prevents the exit of snow and dry ice through outlet opening 16 of part 2 or moves toward the center part of the compression chamber and counter to piston 15. Pistons 6 and 15 may also simultaneously or during part of their strokes simultaneously and consecutively during another part of their strokes toward center part 1. It is obvious that, by this action of the pistons and the configuration of the compression chamber, a homogeneous and effective compression of the snow is obtained; of particular importance is the precompression of the mass of snow by means of piston 6, whereby a solid core is created in the ice block in contradistinction to other methods, whereby the core of the ice block is usually quite soft. With my method and apparatus, the snow is actively compressed from three sides, and the highest possible specific weight of the dry ice block having a rectangular cross section as indicated by the dotted outline 1' is obtained.

With my method and apparatus, blocks of dry ice of any desired cross sectional configuration can be obtained. For example, if cylindrical blocks are desired, piston 15 shown in Figs. 1, 2, and 3 as having rectangular cross section is replaced by a cylindrical piston 15', and the face 12 of piston 6, which is flat when making blocks of rectangular cross section, is provided with a mould 17 having a half-cylindrical surface as shown in Fig. 4. A corresponding mould 18 is inserted into the center part 1 of the compression chamber and opposite to mould 17. Insertion or changing of such moulds and of piston 15 requires very little time and effort.

The compression apparatus according to my invention and as described may be mounted on wheels as indicated in Figs. 3 and 4 and, thereby, be adapted to serve a plurality of carbon dioxide snow generators 19; these generators may have large dimensions and capacity for the previously described reasons, and the number of individual generator cylinders can be considerably reduced in plants using my new compression system as compared with plants using other compression systems.

While I believe the above described embodiments of my invention to be preferred embodiments, I wish it to be understood that I do not desire to be limited to the exact details of design and construction shown and described, for obvious modifications will occur to a person skilled in the art.

What I claim is:

1. An apparatus for compressing carbon dioxide snow into blocks of dry ice comprising a central compression chamber, a loading chamber adjacent to and communicating with said central compression chamber, lateral extension chambers being in line, adjacent to, and communicating with said central chamber, a compression piston in said loading chamber and in each of said extension chambers, and an operating mechanism associated with each of said pistons adapted to move said pistons toward and from said central chamber.

2. An apparatus as claimed in claim 1 in which said central chamber together with said loading chamber and said lateral extension chambers form a T.

3. An apparatus as claimed in claim 1 in which said central chamber, said loading chamber, and said lateral extension chambers are all in a substantially horizontally positioned plane.

4. An apparatus for compressing carbon dioxide snow into blocks of dry ice comprising a central compression chamber, a loading chamber adjacent to and communicating with said central chamber, lateral extension chambers being in line, adjacent to, and communicating with said central chamber, a compression piston in said loading chamber having an operating front surface, a piston in each said extension chambers, an operating mechanism associated with each of said pistons and adapted to move said pistons toward and from said central chamber, an exchangeable mould attached to the operating surface of said compression piston in said loading chamber, and another exchangeable mould arranged within said central chamber and opposite said first mentioned mould for making blocks of ice of various cross sectional configurations.

5. An apparatus for compressing carbon dioxide snow into blocks of dry ice comprising a central compression chamber, a loading chamber adjacent to and communicating with said central chamber, lateral extension chambers being in line, adjacent to, and communicating with said central chamber, a charging piston in said loading chamber, a compression piston in one of said extension chambers, and a movable closure in the other of said extension chambers, said pistons and movable closure being adapted to reciprocatingly move toward and from said central chamber and to thereby, move the snow from said loading chamber into said central chamber and to compress it into a block of dry ice of homogeneous density.

JOSEF KOBOLD.