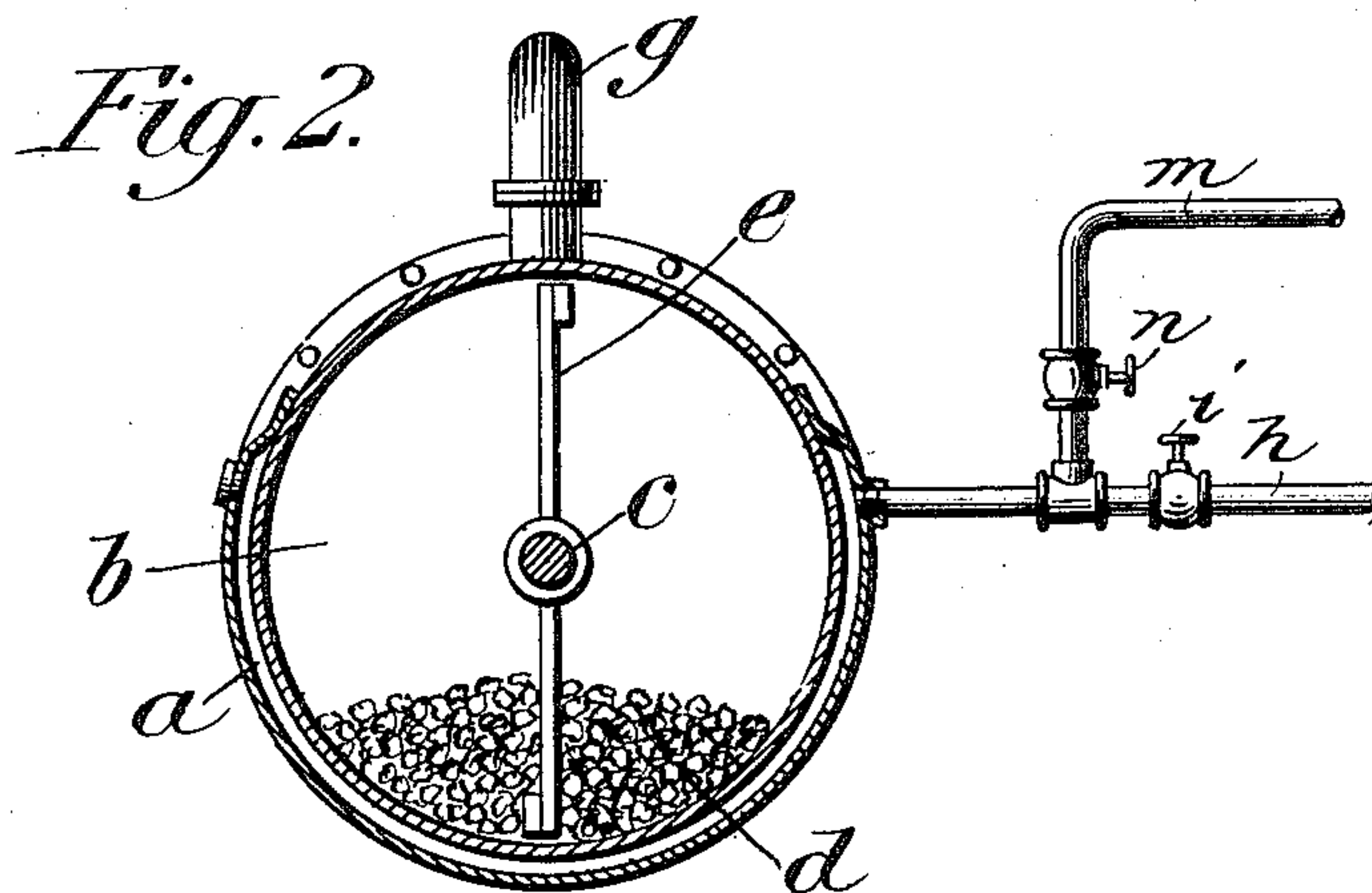
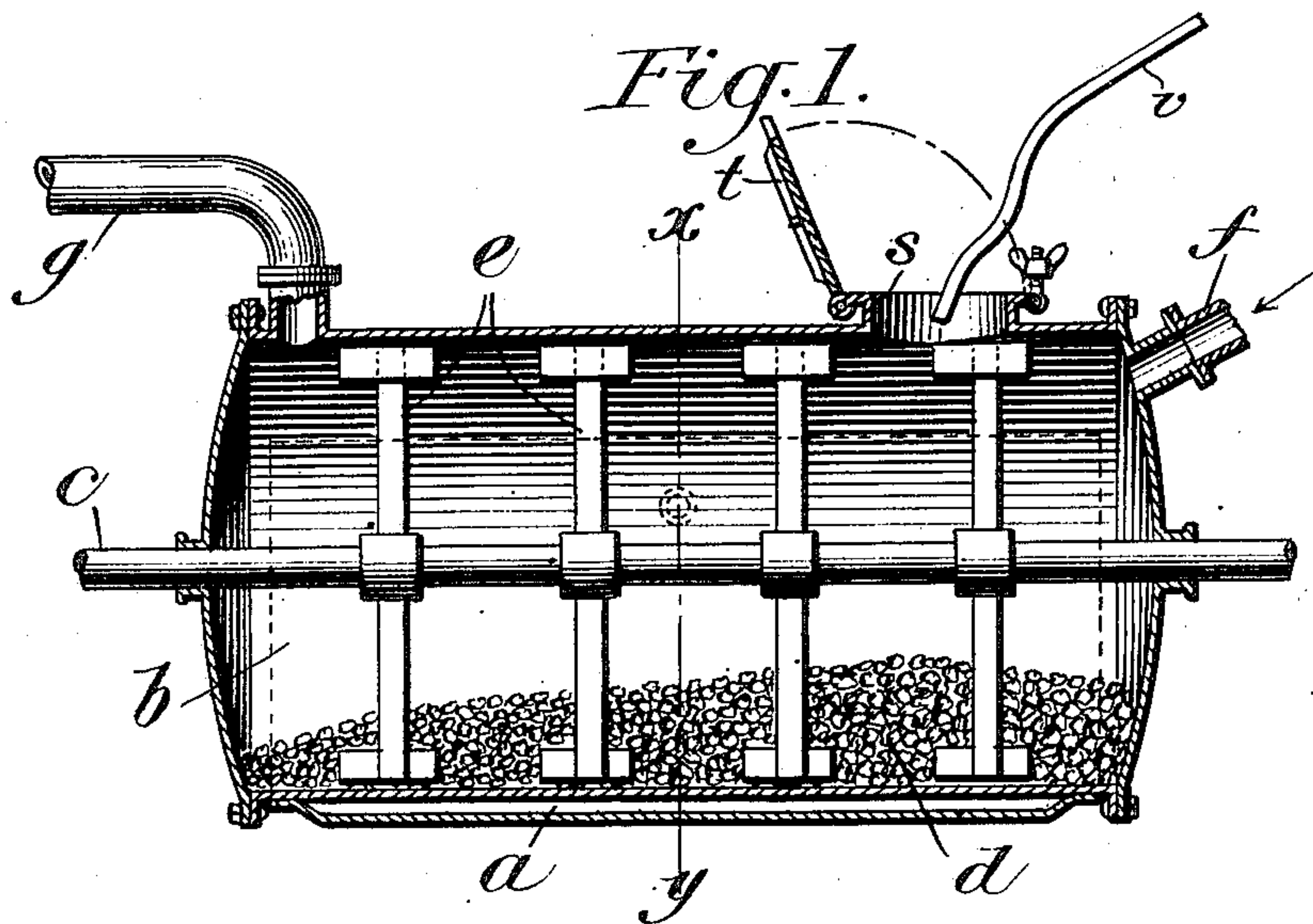


A. WIENS.  
 PROCESS FOR THE MANUFACTURE OF FORMATES.  
 APPLICATION FILED FEB. 24, 1906.

993,331.

Patented May 23, 1911.



Witnesses:  
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# UNITED STATES PATENT OFFICE.

ARNOLD WIENS, OF BITTERFELD, GERMANY.

PROCESS FOR THE MANUFACTURE OF FORMATES.

993,331.

Specification of Letters Patent.

Patented May 23, 1911.

Application filed February 24, 1906. Serial No. 302,744.

To all whom it may concern:

Be it known that I, ARNOLD WIENS, a subject of the German Emperor, residing at Bitterfeld, in the Empire of Germany, have  
5 invented a certain new and useful Process for the Manufacture of Formates, of which the following is a specification.

In the manufacture of formates from caustic alkalies and carbon monoxid, it has  
10 hitherto been considered necessary that the caustic alkali should be used in a finely divided condition. In some instances, the caustic alkali is, before use, finely powdered and eventually mixed with diffusing  
15 media such as lime or coal, while in other instances, it is used in the form of solutions which, by means of stirring devices are brought into intimate contact with the current of carbon monoxid. I have discovered,  
20 however, that there is no necessity for reducing the caustic alkali to a finely divided condition before use, and that the theoretical yield can still be obtained, even when the alkali is used in large pieces (for in-  
25 stance, of a size varying between that of a pea and that of the fist) and without admixture of the alkali with such substances as lime or coal.

In the accompanying drawings, Figure 1  
30 represents a vertical longitudinal section of an apparatus suitable for carrying out the invention; Fig. 2 represents a vertical transverse section thereof.

Referring to the drawing, *b* indicates a  
35 vessel having a jacket *a* into which a heating means, for instance, superheated steam, may be introduced, as, for example, through an inlet pipe *h* provided with a cutoff valve *i*. In the vessel *b*, the lumps *d* of caustic  
40 alkali are placed. A shaft *c*, provided with stirrer arms *e* is rotated to stir the lumps *d*. The gas is introduced by the pipe *f* and is led away by the pipe *g*.

*m* indicates an inlet pipe provided with a  
45 cut-off valve *n*, for the admission of any cooling medium to the jacket *a*, for the purpose hereinafter described.

*t* indicates a charging door for the intro-  
50 duction of the lumps of alkali and *v* indicates means for introducing water into the apparatus.

In carrying out the invention, it has been found sufficient that the caustic alkali, in its usual commercial form, should be  
55 broken up into fairly large pieces (ranging, for instance, from the size of a pea to the

size of the fist), which pieces, without depriving them of their moisture, (amounting to about 4%) are put into the apparatus wherein they are subjected to the action  
60 of carbon monoxid under pressure and at an initial temperature of from 100° C. to 120° C., this being the temperature of the heating medium. Experience has shown that when the pieces are stirred by suitable  
65 means, formates are immediately formed while heat is at the same time evolved. The formate formed at the surfaces of the pieces of caustic alkali separates therefrom, with the result that the gas will constantly  
70 act upon particles of alkali free from formates and that the whole amount of caustic alkali will, in a short time, be converted into formate. After the beginning of the  
75 reaction, cooling will be effected by circulating through the apparatus (*i. e.*, through the cooling jacket *a*) cold water, cold air, or the like, so that a rise in temperature above the decomposition point of  
80 the formate, *i. e.*, about 270° C., is avoided.

In one operation, I may employ 100 kilograms of caustic soda. Carbon monoxid, at eight atmospheres pressure and at a temperature of about 20° C. may then be supplied, the pressure being maintained until  
85 the entire quantity of caustic soda has been converted into formate. After about two-thirds of the amount of caustic alkali employed has thus been converted, water is admitted into the apparatus through the pipe  
90 *v* in quantity not exceeding 2% of the caustic alkali employed. This is done for the purpose of causing the mass which at that time has been reduced to powder, to agglomerate. The agglomeration or ball-  
95 ing together of the particles of formate, due to the admission of the water, withdraws then, in large measure from any of the caustic alkali that has not thus far been converted and enables the latter to be more  
100 effectively exposed to the action of the carbon monoxid.

Having thus described my invention, what I claim is:

1. The process for the manufacture of  
105 formates, which consists in subjecting the caustic alkali in lump form to the action of carbon monoxid under pressure at an initial temperature of about 100° to 120° C., thereby converting the outer surface of said  
110 lumps into formates and completing the conversion of said lumps into formate by



progressively separating the formate mechanically from their outer surfaces so as to give the carbon monoxid access to the portions within; substantially as described.

5 2. The process for the manufacture of formates, which consists in subjecting the caustic alkali in lump form to the action of carbon monoxid under pressure at an initial temperature of about 100° to 120° C., there-  
10 by converting the outer surface of said lumps into formate, completing the conversion of said lumps into formate by progressively separating the formate mechanically from their outer surfaces so as to give  
15 the carbon monoxid access to the portions within, and, during the progress of the reaction, maintaining the temperature below the decomposition temperature of the formed formate; substantially as described.  
20 3. The process for the manufacture of formates, which consists in subjecting caustic alkali in lump form to the action of carbon monoxid under pressure at an initial temperature of about 100° to 120° C. there-  
25 by converting the outer surface of said lumps into formate, agitating the lumps so as to separate therefrom the formed formate, continuing said agitation and further admission of carbon monoxid so as to progressively  
30 convert the lumps into formate, and cooling the mass so as to maintain the temperature below the decomposition temperature of the formed formate; substantially as described.  
35 4. The process for the manufacture of formates, which consists in subjecting caustic alkali in lump form to the action of carbon monoxid under pressure at an initial temperature of about 100° to 120° C., there-

by converting the outer surface of said 40 lumps into formate, progressively separating the formate from the outer surfaces of the lumps by agitation so as to give the carbon monoxid access to the portions within, and, after about two-thirds of the lumps of 45 caustic alkali have been converted into formates, agglomerating the formed formates by adding about 2% of water, and thereafter subjecting the mass to the further action of the carbon monoxid; substantially as 50 described.

5. The process for the manufacture of formates, which consists in subjecting caustic alkali in lump form to the action of carbon monoxid under pressure at an initial 55 temperature of about 100° to 120° C., thereby converting the outer surface of said lumps into formate, progressively separating the formate from the outer surfaces of the lumps by agitation so as to give the carbon monoxid access to the portions within, and, after about two-thirds of the lumps of 60 caustic alkali have been converted into formates agglomerating the formed formates by adding about 2% of water, thereafter subjecting the mass to the further action of the carbon monoxid, and maintaining the temperature below the decomposition temperature of the formed formate during the progress of the reaction. 70

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

ARNOLD WIENS.

Witnesses:

JULIUS RUMLAND,  
CARL G. RICKEBEN.