

Feb. 25, 1930.

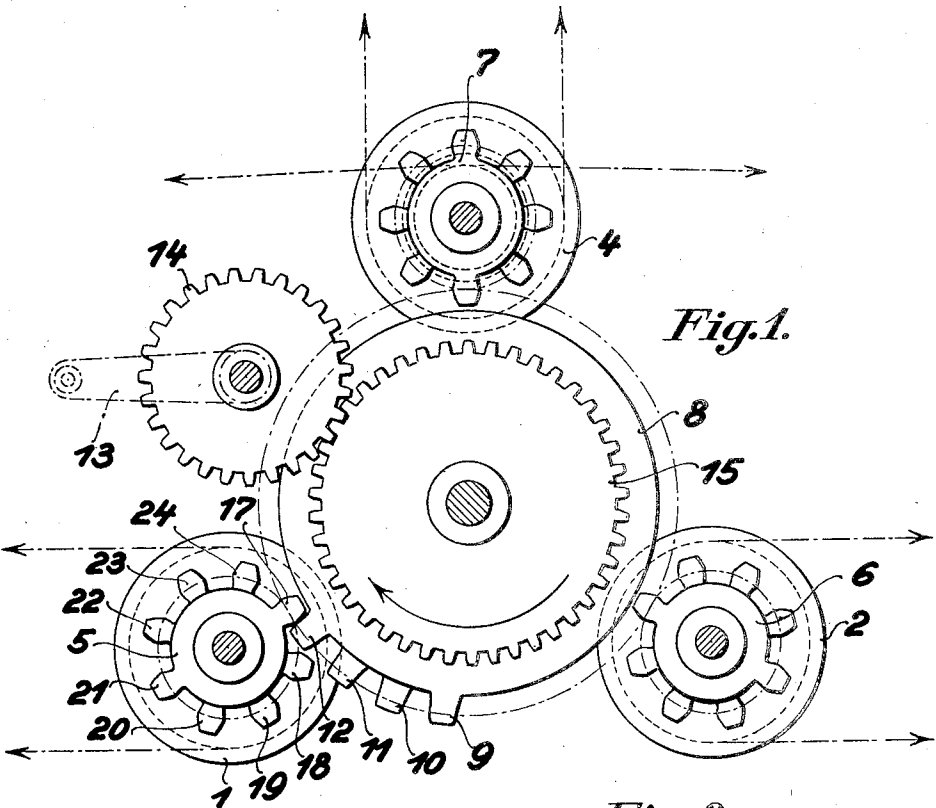
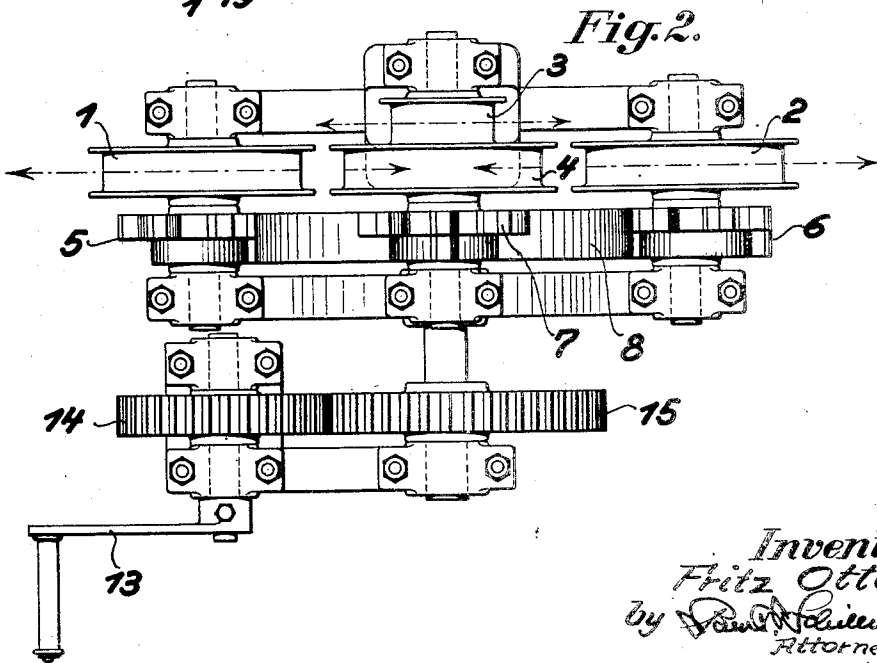
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1,748,390

INTERMITTENT GEAR

Filed July 7, 1927

3 Sheets-Sheet 1



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Fig.3,A-A.

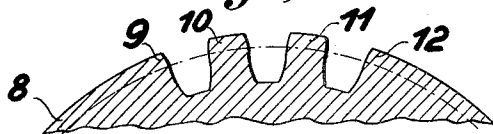


Fig.4,B-B.

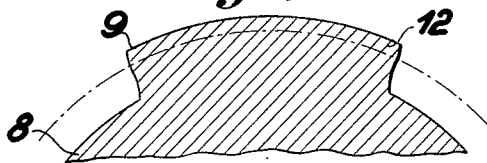


Fig.5.

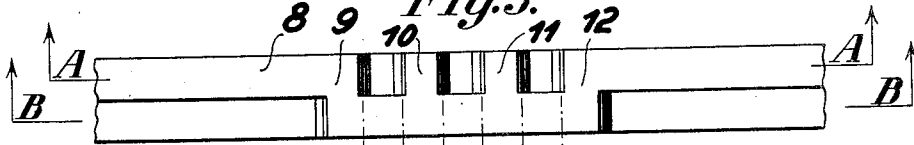


Fig.6.

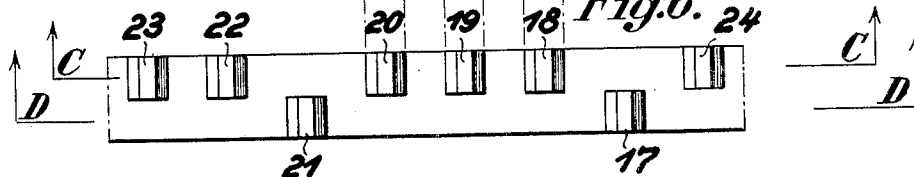


Fig.7,C-C.

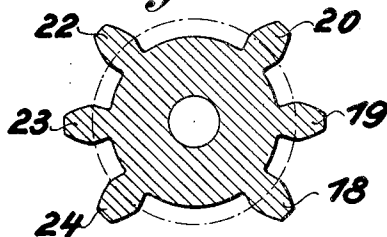
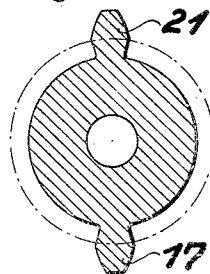


Fig.8,D-D.



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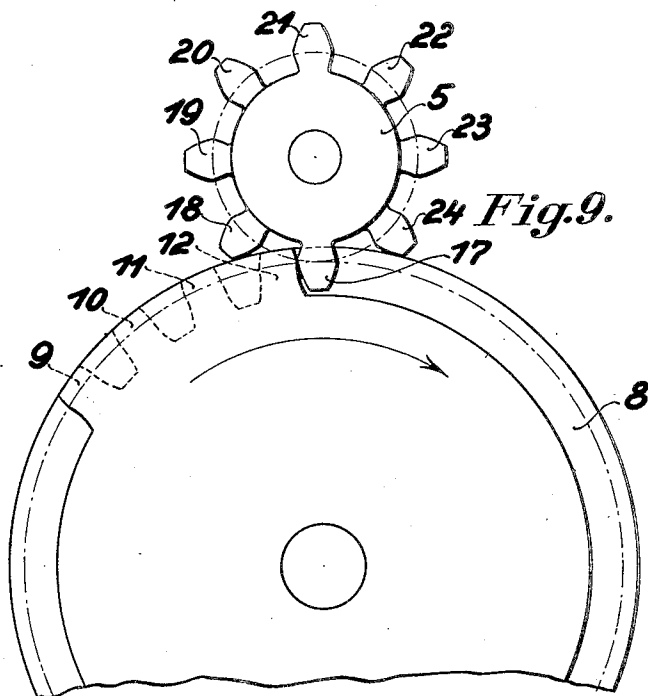
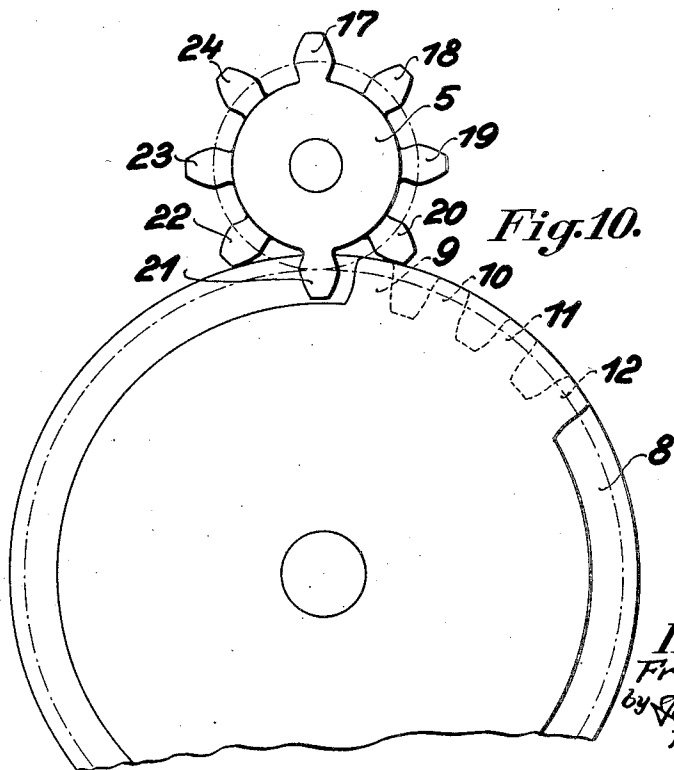
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INTERMITTENT GEAR

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3 Sheets-Sheet 3



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UNITED STATES PATENT OFFICE

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INTERMITTENT GEAR

Application filed July 7, 1927, Serial No. 203,891, and in Germany July 31, 1926.

This invention has reference to reversing means for the valves of furnaces fed with gaseous fuel such as producer furnaces, coke-chamber ovens with regenerative fuel distribution, as well as for furnaces and ovens for metallurgical and other industrial purposes. In the reversing means for regenerative furnaces or producers, such as for instance in the case of coke ovens it has been common heretofore to simultaneously reverse the passage of the gases, the fresh air and the waste gases or waste heat. With more recent constructions the reversal is serially effected in such a manner that as an instance the gas passage is closed on the left-hand side of the oven, whereupon the fresh air is reversed, so as to be used for the heating and at the same time the passage of the waste heat to the chimney is likewise reversed, and then the gas passage is opened on the right-hand side of the oven. This manner of reversing has been usually effected by various methods and appliances, thus for instance by means of three separate reversing pulleys, winches or the like or mostly by a single reversing pulley, these appliances being associated with suitable switching or regulating means in order to allow of the three kinds of reversing movements referred to or even a plurality of such reversals being serially effected one after the other.

Now in view of this general state of the art this invention has reference to a reversing device for the gas valves, air valves and waste gas or heat valves of ovens or furnaces of the kind referred to by means of which the reversing movements may be effected one after the other and without the necessity of special switching or regulating means.

The invention is shown by way of example on the accompanying drawings in Fig. 1 in front elevation and in Fig. 2 in top plan view. Fig. 3 is a detail showing the operating gear wheel in sectional view on the line A—A of Fig. 5, while Fig. 4 is a section on the line B—B of Fig. 5. Figs. 5 and 6 show developments of operating gear wheels. Fig. 7 is a sectional view on the line C—C of Fig. 6 and Fig. 8 is a sectional view on the line D—D of Fig. 6. Fig. 9 is an elevation illustrating

the manner of engagement of the driving instrumentalities and Fig. 10 is a view similar to that of Fig. 9 but with different relative position of the parts.

In the exemplification shown in Figs. 1 and 2 of the drawings it may be assumed that the drum 1 is employed for the reversing of the gas cocks at the left of the drawing while the drum 2 operates the gas cocks at the right-hand side of the device. The drum 3 may serve for the operation of the fresh air valves or dampers while the drum 4 is intended for the operation and the reversal of the waste heat. Drums 3 and 4 are adapted to be simultaneously rotated. Now, the important feature of the invention resides in the fact that the operating gear wheels of the drums 1, 2, 3, 4, that is to say the gear wheel 5 of the drum 1, the gear wheel 6 of the drum 2 and the gear wheel 7 of the drums 3 and 4 are operated from a driving gear wheel 8 the peripheral surface of which is equal to or larger than the sum of the peripheral surfaces of the three operating gear wheels 5, 6, 7 revolving thereon. With this end in view the driving wheel 8 carries only as many teeth as are required for effecting the rotation of the gear wheels 5, 6, 7.

Assuming now that for the reversal half a revolution of each of the driving gear wheels 5, 6, 7 is required, it results that, in case each of the driving wheels is provided with eight teeth, the four teeth 9, 10, 11 and 12 of the peripheral surface of the master wheel 8 will be sufficient for the purpose mentioned.

The reversing is effected in the following way. By the rotation of the master driving wheel 8 in the direction of the arrow by means of the crank 13 and the intermediate wheels 14 and 15 the driving wheel 5 is given half a revolution, and the gas cocks at the left-hand side of the machine are closed. Thereupon the tooth 12 of the master driving wheel 8 becomes engaged with the teeth of the gear wheel 7 and after moving the same through half a revolution the tooth 12 becomes engaged with the gear wheel 6 which is likewise rotated through half a revolution. By this means the driving wheel 7 will reverse the fresh air valves or dampers

and the waste heat valves or slides, while the gas cocks at the right-hand side of the machine are operated and opened by the driving wheel 6. It is evident that by a corresponding increase of the periphery of the master driving gear wheel 8 intermissions or any desired durations may be interposed after each reversal of the gas cocks and respectively of the air valves and waste heat slides. This is the point of great economical importance, because within the intermissions mentioned a perfect combustion of the gases may be relied upon.

If, however, the arrangement of the reversing means would only be limited to the construction described the subsidiary gear wheels 5, 6, 7 would be in labile equilibrium, as long as their teeth are disengaged from the teeth 9—12 of the master gear wheel 8.

In the endless chain drives of the drums 1, 2, 3, 4 one of the legs of the chain drive may be coated, as is frequently the case with the chain drives for the operation of the fresh air valves or dampers and of the waste heat slides. As a result thereof the drums and consequently the driving gear wheels 5, 6 and 7 are liable to become disturbed so that the fresh air valves or dampers swing back and the waste heat slides are not completely closed or opened, thereby producing danger of an explosion. For the machine itself the difficulty referred to produces the inconvenience that the disturbing of the driving wheels 5, 6 and 7 interferes with the regular engagement of the teeth of the master gear wheel 8 with the teeth of the said driving wheels. These dangers and difficulties are obviated in accordance with this invention by the provision of the locking of each driving wheel by two of its teeth which latter, after the reversal has been accomplished, are adapted to bear upon the periphery of the pitch circle of the master gear wheel 8. In order to produce this kind of engagement the teeth of the master gear wheel 8 should be arranged in two different planes; and the same arrangement should be made with regard to the driving gear wheels 5, 6 and 7. In Figs. 5 and 6 of the drawing the master gear wheel 8 is shown developed and spread in a plane. Fig. 5 showing four teeth 9, 10, 11 and 12, these teeth being arranged in the planes A—A and B—B respectively as clearly shown in Figs. 3 and 4 of the drawing. In Fig. 6 one of the driving wheels 5, 6 or 7 respectively is shown developed and spread in a plane, and, as appears from the drawing the teeth 19, 20, 21, 22, 23, 24 thereof are respectively arranged in the planes C—C and D—D in the manner shown in Figs. 7 and 8 of the drawings. Upon the beginning of the reversing movement the tooth 12 of the master gear wheel 8 makes contact with the tooth 17 of the driving gear wheel 5, as is also clearly shown in Fig. 1 of the drawings.

Thereupon tooth 11 of the master gear wheel makes contact with the tooth 18 of the wheel 5, then tooth 10 with tooth 19, tooth 9 with tooth 20 and the rotation is continued, until tooth 20 of the subsidiary driving wheel 5 has assumed the position of the tooth 24 shown in Fig. 1 of the drawing at the beginning of the reversing movement.

The tooth 22 has now assumed the position of the tooth 18 at the beginning of the reversing operation. The two teeth 20 and 22, shown in Fig. 7 of the drawing, will now become engaged with the toothless part of the periphery of the master gear wheel 8 (Fig. 3). The engagement of the teeth of the master gear wheel 8 with the teeth of the subsidiary gear wheels 5, 6 and 7 is illustrated by the broken connecting lines of Figures 5 and 6 of the drawing.

In Fig. 9 of the drawing the relative position of the driving wheel 5 with relation to the master gear wheel 8 is shown at the beginning of the reversing operation while in Fig. 10 the parts are shown in the position assumed after the termination of the reversal. It appears from Fig. 10 that the driving wheel 5 is locked by the teeth 20 and 22 after the termination of the reversing operation, while on the other hand it is likewise locked at the beginning of the reversing operation by the teeth 18 and 24, as shown in Fig. 9 of the drawing.

It will therefore be apparent that for the production of the automatic locking of the driving gear wheels their teeth should be so arranged that the teeth 17 and 21 which upon each reversal are first engaged by the master gear wheel 8 should be disposed in a plane different from that of the locking teeth 18 and 24 or respectively 20 and 22, as shown in Figures 6, 7 and 8 of the drawing. In a similar manner the sides of the teeth 9 and respectively 12 of the master gear wheel 8 which, upon the beginning of the reversing operation will be first engaged are disposed in a different plane from that of the other sides of the teeth, as appears from Figures 3, 4 and 5.

Instead of gear wheels with teeth of ordinary standard shape gears with teeth of other shape may be employed, and the locking of the engaging parts may be performed by any suitable means and other modifications made within the scope and spirit of the invention as set forth in the appended claims.

I claim:—

1. In an operating device of the kind described, a plurality of spacedly disposed subsidiary gear wheels, a large master gear wheel between said subsidiary gear wheels of peripheral length equal to at least the sum of the peripheral lengths of the subsidiary gear wheels, a set of gear teeth on the master gear wheel arranged in the same plane to produce a partial revolution of the subsidiary gear wheels, a plain peripheral portion on said

master gear wheel in a plane different from the plane of the set of gear teeth and providing a pair of teeth beyond the terminal teeth of the said set of teeth, two teeth on each subsidiary gear wheel arranged in the same plane for engagement with the teeth of the plain peripheral portion of the master gear wheel, and adapted to rest upon said plain peripheral portion of the master gear wheel after the reversal of rotary movement, and a set of additional gear teeth on the subsidiary gear wheels arranged in a plane different from the two teeth above-named and engageable with the set of teeth of the master gear wheel.

2. In an operating device of the kind described, spacedly disposed subsidiary gear wheels, a master gear wheel between said subsidiary gear wheels of a peripheral length amounting to at least the sum of the peripheral lengths of the subsidiary gear wheels, a set of gear teeth on each subsidiary gear wheel, a set of gear teeth on the master gear wheel to engage the gear teeth on the subsidiary gear wheels, a plain peripheral portion on the master gear wheel arranged in a plane parallel with and providing a pair of teeth beyond the end teeth of its set of teeth, and a pair of teeth upon each subsidiary gear wheel situated in a plane different from those of its said set of teeth adapted for engagement with the teeth of the plain peripheral portion of the master gear wheel and to rest upon said peripheral portion of the gear wheel after the reversal of rotary movement.

In testimony whereof I affix my signature.

FRITZ OTTO.