H. E. McDONNELL.

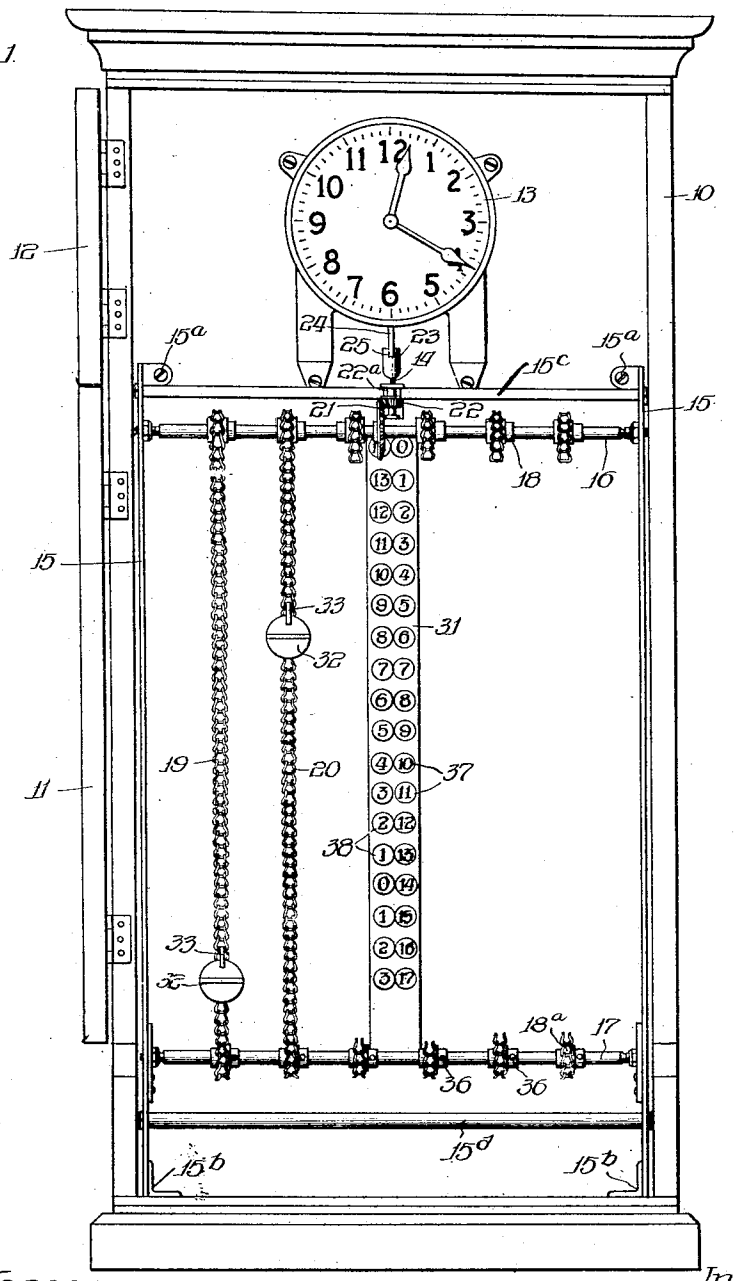
INDICATOR FOR OPERATING CHANGES.

APPLICATION FILED NOV. 4, 1918.

1,372,970. **Patented Mar. 29, 1921.**

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses:

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2 SHEETS—SHEET 2.

Fig. 2

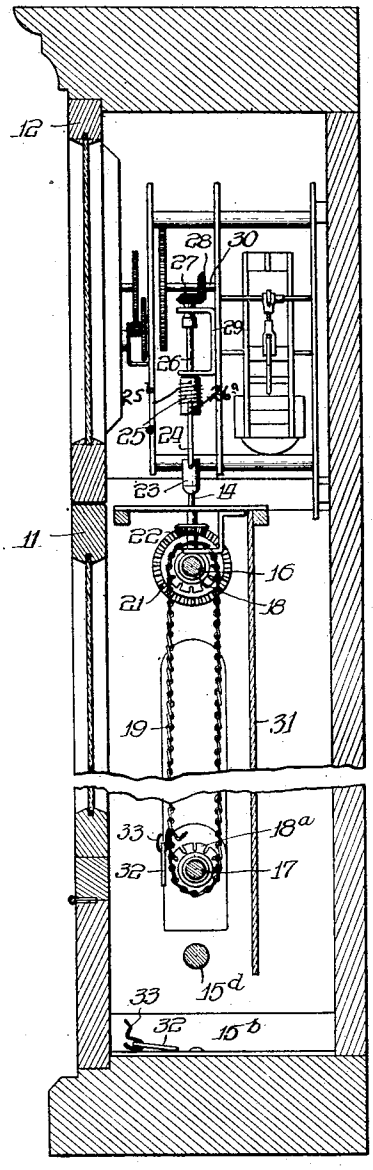


Fig. 3

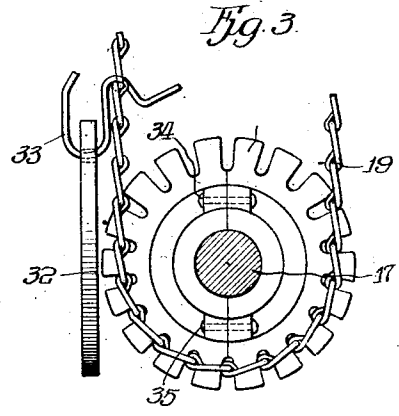
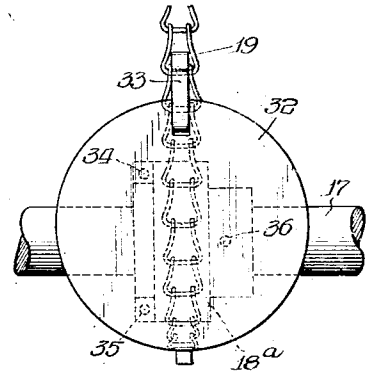


Fig. 4



Witnesses

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UNITED STATES PATENT OFFICE.

HARRY E. McDONNELL, OF SOUTH CHICAGO, ILLINOIS.

INDICATOR FOR OPERATING CHANGES.

1,372,970. Specification of Letters Patent. Patented Mar. 29, 1921.

Application filed November 4, 1918. Serial No. 261,017.

To all whom it may concern:

Be it known that I, HARRY E. McDONNELL, a citizen of the United States, residing at South Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Indicators for Operating Changes, of which the following is a specification.

My invention relates to mechanism for indicating operating changes, and has for its particular object the provision of a mechanism whereby the times when operating changes take place within a blast furnace during its operations are indicated.

In the operation of blast furnaces where the proportion of fuel, ore, etc., which is charged into the furnace is changed, it becomes necessary to know approximately when the particular burden or charge has reached a particular point in the blast furnace, and it is the purpose of my invention to provide a device which will always indicate just when a particular burden reaches a particular point in the furnace, as, for instance, it frequently becomes desirable to change the quantity of limestone or coke charged into the furnace or to increase the amount of ore which is charged into the furnace, and heretofore it has been the practice to keep a record of the time when these changes are made for the benefit of the different shifts of men who attend the furnace. With my device all of this can now be dispensed with, and it is possible to tell by simply looking at the device just how far a particular charge of material has progressed through the furnace.

Another and further object of my invention is the provision of a mechanism which will enable the operators of a blast furnace to determine the nature and character of the metal which is tapped off from the furnace, as, for instance, a change in the proportion of the materials with which the furnace is charged changes the character of the metal produced, and it is important in the operation of a blast furnace to determine when a particular burden or charge has been completely reduced and has reached the tapping hole of the furnace, all of which is accomplished by the use of my invention.

A further object of the invention is the provision of a device which is simple and efficient in operation, not likely to get out of order, and which can be easily installed.

My invention will be further and better understood by reference to the accompanying drawings, in which—

Figure 1 is a front elevation showing the arrangement of the operating parts of my invention;

Fig. 2 is a vertical sectional view through the center of Fig. 1;

Fig. 3 is a side elevation of one of the split sprocket wheels showing the manner of attaching an indicator to one of the chains; and

Fig. 4 is a front elevation of the arrangement shown in Fig. 3.

Referring now specifically to the drawings, a cabinet 10 is shown to which a pair of upper and lower outwardly opening hinged doors 11 and 12 are secured. Mounted within the upper portion of the cabinet 10, in any suitable manner, is a clock 13 which has suitable operating connections with the mechanism hereinafter described. Mounted within the cabinet is a rectangular metal frame composed of side members 15, 15, which are secured to the cabinet in any suitable manner, as by screws 15^a at the top, and angles 15^b at its bottom, and a pair of top and bottom members 15^c and 15^d, respectively, which are connected to the side members 15 at each of their ends. Mounted in the upper and lower ends of the rectangular frame is a pair of transversely extending shafts 16 and 17, respectively, which are secured to the frame in any suitable manner so as to allow free rotation of the said shafts.

Secured to the shaft 16 is a plurality of spaced split sprocket wheels 18, each of the said sprocket wheels being alined with sprocket wheels 18^a mounted upon the lower shaft 17 and upon which endless chains 19, 20 run. The upper shaft 16 has a gear wheel 21 mounted thereon so as to mesh with a second gear wheel 22 which in turn is secured to an operating shaft 14 which extends upward through a journal bearing 22^a mounted in the member 15^c, and has secured thereto at its upper end a member 23, which member has a transverse groove across its upper face, and into which a member 24, is inserted. A pin 25 passes through the member 23 and the lower end of the member 24. The member 24 extends upward into engagement with a member 25^a being held in position in a groove 26^a. A coil spring 25^b

serves to hold the upper end of the member 24 in proper position in the groove 26a. The member 24 thus forms a connecting member between the clock and the indicating mechanism. Connected to the member 25a is another vertical shaft 26 to which at its upper end is secured a gear wheel 27 which is in mesh with a gear wheel 28, the said shaft 26 being held in position by a bracket 29, which is secured to the frame of the clock in any suitable manner. The gear wheel 28 is mounted upon a shaft 30 which is connected to the operating gears of the clock so that motion will be transmitted to the shaft 16 through the series of connections described above. A graduated scale 31 having two rows of indicating figures thereon extends in a vertical direction between the shafts 16 and 17. The number of sprocket wheels and chains will depend, of course, upon the number of furnaces in operation, or the number of units of which it is desired to keep a record of the operating changes. A set of indicators such as 32 are provided, and are secured to the sprocket chains by means of a hook 33 fitted thereto, the shank portion of which is inserted through the links of the chain 19, the inner end of the hook 33 being so shaped that, as the chain 19 travels around the sprocket wheel 18a, the rear end of the hook 33 will rest upon the sprocket wheel 18a and be pushed upward and outward by the sprocket wheel until it is disengaged from the chain, thus preventing the indicators 32 from being carried around the wheel 18a by the chain 19. The split sprocket wheels 18 are held together by means of screws or rivets 34, 35, and are secured to the shafts by means of pins such as 36 so that if the operation of a furnace is discontinued the pins 36 are removed and the sprocket wheel, which is thus disconnected from the shaft, will stop, and when the furnace is put into operation again the sprocket wheel is connected up and starts the chain in motion. It will thus be seen that the shaft 16 is actuated through the gear wheels 21 and 22 and through the operating connections with the gears of the clock, so that as the clock mechanism operates to indicate time, the sprocket chains to which the indicators are secured will be caused to travel. It has been determined by experiments that in the furnace of an ordinary height it takes approximately 14 hours for a particular charge of material to be reduced and pass from the top of the furnace down to the bottom, or into a state of complete reduction. I have therefore arranged the indicating scale to cover a period of fourteen hours to correspond with the length of time necessary to reduce a particular charge, and 3 or 4 hours beyond that, to show further elapsed time, so that as the burden of the furnace is changed and one of the indicators is attached to the chain 19 by means of the hook 32 through one of the links in the chain during the successive stages in the operation of the furnace, a glance at that particular indicator and its position with respect to the scale will indicate how long that particular change of burden has been in the furnace, and also how many hours will elapse before the particular change becomes effective.

The indicators 32 are in different colors or marked in different manners in order to correspond to the various materials used in the charge of the furnace. It will therefore be understood that when an operating change is made a counter 32 is hung upon the chain opposite the upper zero and that each chain corresponds to a different furnace. It is therefore possible, simply by glancing at the device, for the operator to determine how far a particular change has progressed and just when a particular change has made its effect, it being understood that the length of time elapsing between the making of an operating change in the charging of the furnace and the reduction of the charge is the same as the length of time it takes for the indicator to travel from the top of the graduating scale to the bottom.

It will be understood that my invention may be used not only in connection with the operation of blast furnaces, but in connection with the operation of any machine or process wherein time is a factor in the operation, and it is necessary to know the time when each succeeding stage of an operation will be reached, it only being necessary, of course, to know the time it takes to complete a particular operation, and then making the gear or sprocket wheels of the device of such dimension that the mechanism will be driven at the proper rate of speed to correspond with the operating changes.

While I have described more or less precisely the details of construction, I do not wish to be understood as limiting myself thereto, as I contemplate changes in form and the proportion of parts, and the substitution of equivalents, as circumstances may suggest or render expedient without departing from the spirit or scope of my invention.

I claim:

1. In combination, a clock mechanism, a case having rotatable upper and lower spaced shafts, alined sprocket wheels secured to said shafts, chains located upon each pair of alined sprocket wheels, indicators having hooks thereon adapted to be secured to the said chains and to be forced out of engagement with the said chains by the sprocket wheels as the chains pass around the lower sprocket wheels, an indicator having figures marked thereon to in-

dicate hours secured to said case and extending parallel with the said chains, and means connecting the clock mechanism with the upper rotatable shaft.

2. In combination, a clock mechanism, a case having upper and lower spaced rotatable shafts therein, alined sprocket wheels secured to said shafts, chains located upon each pair of alined sprocket wheels, indicators carried by said chains, hooks adapted to secure the indicators to the chains, the said hooks having rearwardly extending portions adapted to be engaged by the said sprocket wheels whereby the said hooks are forced out of engagement with the said chains, and means connecting the clock mechanism with the upper rotatable shaft.

Signed at Sparrows Point, Maryland, this 15th day of October, 1918.

HARRY E. McDONNELL.