

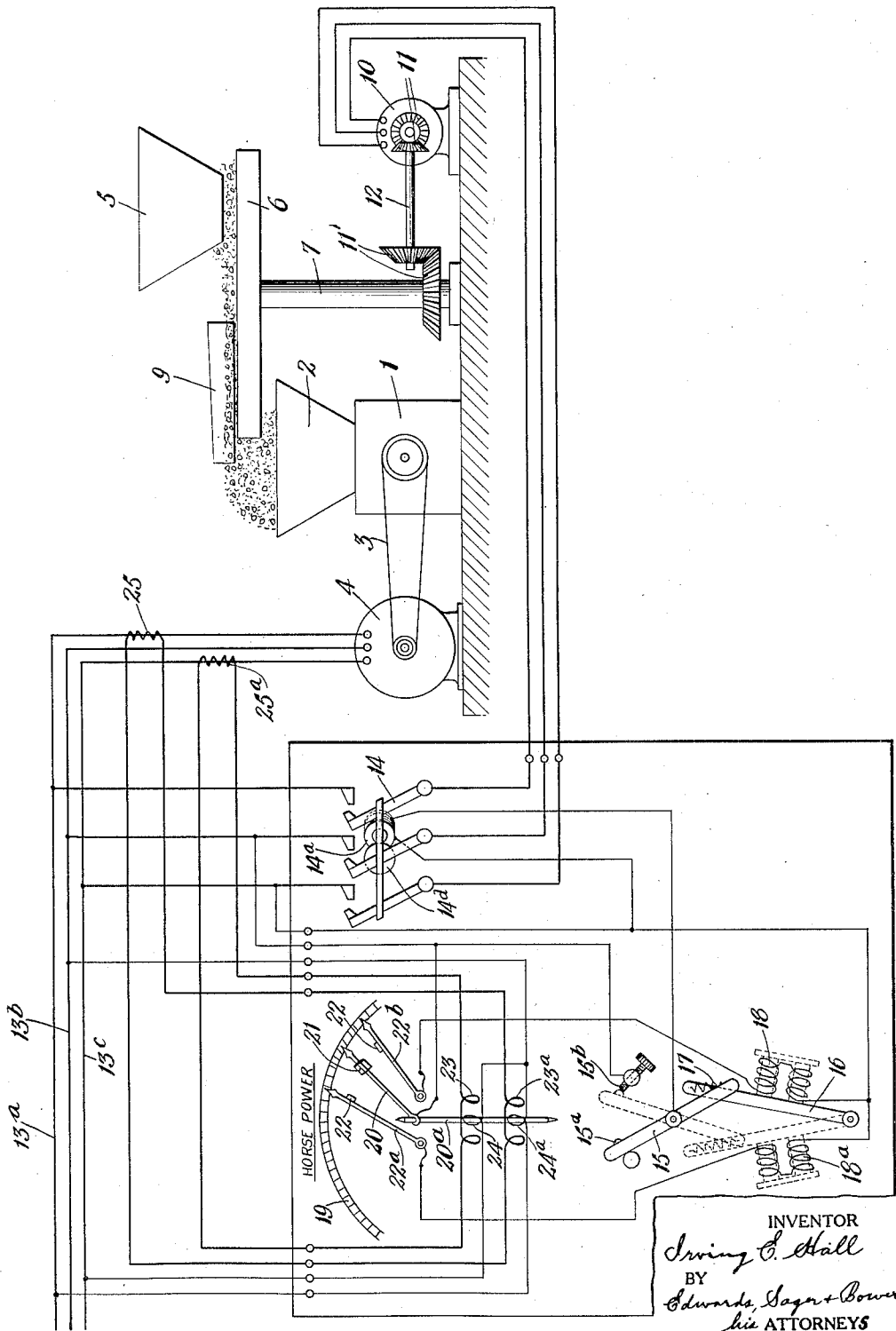
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MEANS FOR FEEDING AND TREATING MATERIAL

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UNITED STATES PATENT OFFICE.

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MEANS FOR FEEDING AND TREATING MATERIAL.

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To all whom it may concern:

Be it known that I, IRVING E. HALL, a citizen of the United States, residing at Bethlehem, in the county of Lehigh and State of Pennsylvania, have invented certain new and useful Improvements in Means for Feeding and Treating Material, of which the following is a specification.

This invention relates to apparatus for treating material by pulverizing machines, grinders, crushers, mixers and the like; and particularly relates to the control of the feed of material to machines of that character. In such machines, it is desirable that their load shall be maintained substantially constant, both from the standpoint of insuring proper treatment of the material and also for insuring operation of the apparatus at maximum efficiency and at efficient maximum capacity. This is accomplished by regulating the feed of the material to the machine, reducing the feed when the treating machine is loaded beyond proper capacity and increasing the feed of the material when the treating machine is operating below proper load.

The principal object of the present invention is to secure efficient and dependable control of the material fed to the machine in accordance with the requirements; and to accomplish this by controlling means, which is automatic and of a simple form of construction, and also reliable and durable in operation. Another object is to provide readily adjustable means for insuring the control within any controlling limits desired for the particular character of the material to be treated and to insure dependable operation within the limits desired to as refined and sensitive a degree of accuracy as may be required. Another important object is to provide controlling means of a character which will not only serve to secure the desired regulation, but will also serve as indicating means to the operator showing the conditions and the power consumed, without the necessity of additional or auxiliary indicating instruments. Other objects and advantages of my invention will be understood from the following description and accompanying drawing.

The drawing is a diagram indicating the apparatus for treating the material and also

the controlling and regulating apparatus in a preferred form thereof.

The treating machine is indicated by the reference character 1 and is conventionally shown as having a receiving hopper 2. This machine is shown as being driven by a belt 3 from an electric motor 4. The material to be treated is supplied from a receiving chute or hopper 5 to a table 6. The table is supported on a vertical shaft 7 and is adapted to be revolved so that the material indicated at 8 is carried by the table from the bottom of the hopper 5 and forced against a radially extending plate or scraper 9 positioned on the opposite side of the feed table 6 from the hopper 5. As the material strikes the stationary scraper 9 it is guided into the hopper 2 over the edge of the feed table. Although I have illustrated this form of means for supplying the material to the treating machine, yet any other suitable feeding apparatus might be used such as a traveling belt, conveyor or the like.

The movable element of the feed supplying means, in the present instance the feed table 6, is rotated by an electric feed motor 10. The driving connection between the feed motor and the shaft 7 is indicated as comprising cooperating bevel gears 11, which drive the shaft 12, which in turn drives the vertical shaft 7 through the cooperating bevel gears 11'. In the present instance the power is assumed to be derived from three phase supply lines 13^a, 13^b and 13^c, although this invention is applicable to the use of alternating current supply of any phase and likewise to a direct current supply. The three phase power lines are shown as leading to the three phase motor 4, which operates continuously while the apparatus is being used. The feed motor 10 however, is controlled for regulating the supply of material to the treating machine; and is shown as being started and stopped by the closing and opening of a switch 14 in the circuit of the three phase lines which supply the three phase feed motor. Thus the switch 14 has its three movable contact elements connected to the three phase lines leading to the feed motor and the three stationary contacts of the switch 14 are connected respectively to the three phase supply lines. The switch 14 is shown in its

open position and is biased to its open position by gravity or spring pressure or both, as is customary in automatic switches. The switch 14 is adapted to be automatically closed when the coil 14^a is energized, as it then attracts the armature 14^a carried by the movable part of the switch; and will hold the switch closed as long as the coil 14^a is energized; but when the coil 14^a is deenergized, the switch will assume its biased open position and cause the feed motor to be stopped.

The excitation and deenergization of the coil 14^a are controlled by relay switch 15 which is snapped to closed and to open position by movement of arm 16 of the relay. The switch arm 15 is indicated as pivoted at its center, the upper portion carrying a contact 15^a adapted to engage an adjustable fixed contact 15^b. The fixed contact 15^b is connected to one of the supply lines and the movable contact 15^a and arm 15 is connected to another of the supply lines through the actuating coil 14^a of the feed motor switch.

The lower end of the movable element 15 of the relay switch is mechanically connected by a spring 17 to the upper end of the arm 16, the latter arm being shown pivoted at its lower end. The relation of the arms 15 and 16 to each other and to their pivots is such that when the arm 16 is thrown to the left from the position shown in the drawing, the upper end of spring 17 will be carried across the arm 15 and thus by its over center movement will cause the spring 17 to snap the switch arm 15 to closed position and will hold the switch arm 15 firmly in closed position against the fixed contact 15^b and thereby insure a quick and firm closure of the circuit of the coil 14^a whenever the relay switch is closed. Similarly when the arm 16 is moved from its left-hand position to the position shown in full lines in the drawing, the switch arm will be snapped quickly to its open position and firmly held in its open position until again closed.

The arm 16 of the relay is controlled by a pair of relay magnets 18 and 18^a on opposite sides respectively of the arm 16. The arm 16 serves as a common armature for the two relay magnets, being attracted to the position shown in the drawing when the relay 18 is excited and being attracted to its left-hand position when the relay magnet 18^a is excited. In the position shown in full lines in the drawing, the line of action of spring 17 is to the right of the pivot of the arm 16 and the arm 16 will thus be held in the position shown by the spring, even though the coils of relay magnet 18 are deenergized. When the arm 16 is swung to the left by the excitation of the coils of relay 18^a and thus cause the movement of the relay switch arm as above explained, the line of action of the spring 17 is carried to the left of the

pivot of arm 16 and thus cause the arm 16 to be held in its left-hand position even after the coils of relay 18^a are deenergized.

The control of the relay coils is made dependent upon the power supplied to the motor 4 and for this purpose a power regulating instrument is used which likewise serves to indicate the amount of power being consumed and at the same time the operating conditions and the varying conditions of the apparatus. This controlling and indicating instrument is in the form of a wattmeter, which may be of any of the usual types, such as the induction type or dynamometer type, with the provision, however, of special movable and fixed contact making and current conducting elements. This indicating and controlling instrument is shown as having an indicating scale 19 and a movable pivoted pointer 20, the latter however, being current conducting and carrying a contact 21. The pointer 20 is mounted on the pivoted shaft 20^a of the instrument. On each side of the indicating pointer 20 is located a conducting element 22^a and 22^b, each of which carries a contact 22 adapted to be engaged by the contact 21. The conducting elements 22^a and 22^b may have the same pivotal center as the indicating element 20 or a center somewhat offset therefrom as indicated and are adapted to be adjusted manually about their pivots to any desired position according to the requirements of the particular material treated and the work to be accomplished. The indicating element 20 is electrically connected to the supply line 13^b. Each of the conducting elements 22^a and 22^b is electrically insulated from each other and from the pointer 20, the element 22^a being connected to the coils of relay magnet 18^a and thence to the supply line 13^c, whereas the element 22^b is connected to the coil relay 18 and thence to the supply line 13^c. The indicating element 20 of the instrument is controlled in its position by current and potential coils in the same way as the indicating element of a wattmeter; and in the present instance, this is accomplished by current coils 23 and 23^a and by potential coils 24 and 24^a, which are conventionally indicated in the drawings. The current coils are indicated as being stationary and the potential coils as being mounted between them and carried by the shaft 20^a. The current coils 23^a are supplied by current from the secondary of a current or series transformer 25 subjected to current passing in supply line 13^a to the motor 4; and the current coils 23 are connected to the secondary of a series or current transformer 25^a subjected to the current supplied to motor 4 through the supply line 13^c. The potential coil 24 is connected across supply lines 13^c and 13^b; and the potential coil 24^a is connected across the supply line 13^a and

13^b. Thus the power supplied to the three phase motor 4 is measured and indicated by the position of a pointer 20 of the power instrument. The scale 19 may be marked to indicate watts, kilowatts, or H. P. as may be desired.

Assume, as an example, that the capacity of the machine 1 is such that it operates most efficiently at a load of 100 H. P. on the motor 4, and that it is desired that the variation in this load shall not be more than 5% above or 5% below this amount. The element 22^b will then be manually adjusted on the scale at the value of 105 H. P. and the element 22^a will be adjusted manually to the position of 95 H. P. on the scale. As long as the power consumed by the motor 4 is within the limits stated, the pointer 20 will occupy an intermediate position between the two elements 22^a and 22^b, and will at the same time indicate the actual power being consumed by the motor. If, however, the motor load increases sufficiently, due to the feed motor supplying too much material to the machine 1, the pointer 20 will be moved to the right until its contact engages the contact 22 of the element 22^b. This closes a circuit from supply line 13^b through the pointer 20 and through element 22^b to the coils of relay magnet 18 and thence to the supply line 13^c. This energizes the relay magnet 18 which then attracts the arm 16, throwing the relay switch 15 to open position shown in full lines in the drawing. This opens the circuit through the coil 14^a of the feed motor switch, which releases the switch 14 and permits it to move to the open position shown. This, of course, stops the feed motor and causes a reduction of load on the motor 4. As the load reduces, the pointer 20 moves to the left and finally engages contact 22 of element 22^a. This closes a circuit from the supply line 13^b through the pointer 20, element 22^a, through relay coil 18^a to supply line 13^c and causes armature 16 to be attracted from the position shown in full lines and thus close the circuit through the switch coil 14^a. This causes the closure of the feed motor switch and again starts the feed motor, which again feeds the material to the treating machine. This action will continue until the load upon the power motor 4 has increased to the maximum of 105 H. P. when the action previously described will again occur. Thus it is evident that the controlling mechanism will keep the load on the power motor within the limits for which the elements 22^a and 22^b are set; and the controlling instrument will also indicate the operating condition and amount of power being used. Moreover, the control is made definite in its action at the particular points desired and causes the relay contacts to act quickly in closing and in opening the controlling coil of the feed

motor switch, the relay contacts and the feed motor switch contacts being held firmly closed when closed and avoiding chattering and uncertainty of operation.

While I have described one embodiment of my invention, it is evident that various modifications may be made therein without departing from the scope thereof.

I claim:—

1. The combination with a machine for treating material, of a motor for controlling the load on said machine, and an indicating instrument for indicating the load on said machine, said instrument having means for automatically controlling said motor.

2. The combination with a machine for treating material, of a motor for controlling the supply of material to said machine, and means for controlling the speed of said motor, said means also indicating the load on said machine.

3. The combination with a machine for treating material, of a motor for controlling the supply of material to said machine, a power indicating instrument, and means comprising a snap switch for controlling said motor, said means being controlled by said instrument.

4. The combination with a machine for treating material, of a motor for controlling the supply of material to said machine, and electromagnetic means for controlling said motor, said means comprising circuit making and circuit breaking contacts automatically controlled by the load on said machine and a snap switch for controlling said motor.

5. The combination with a machine for treating material, of a motor for controlling the supply of material to said machine, an electromagnetic switch for controlling said motor, an electromagnetic snap relay for controlling said switch, and an instrument for indicating the load on said machine, said instrument also controlling the action of said relay.

6. The combination with a machine for treating material, of a motor for controlling the supply of material to said machine, electromagnetic means for controlling said motor, and an instrument for controlling said means according to the power on said machine, said instrument having manually adjustable elements for limiting maximum and minimum load on said machine.

7. The combination with a machine for treating material, of a motor for controlling the supply of material to said machine, an electromagnetic switch for starting and stopping said motor, an electromagnetic relay for controlling the closing and opening of said switch, and a power indicating instrument for controlling said relay according to the load on said machine, said instrument having a conducting indicating pointer,

an adjustable contact element on one side of said pointer and an adjustable contact element on the opposite side of said pointer.

8. The combination with a machine for treating material, of an electric motor for driving said machine, a second motor for controlling the load on said machine and first named motor, and means for automatically controlling said second named motor, said means being controlled by the watts taken by the first named motor.

9. The combination with a machine for treating material, of an electric motor for driving said machine, a second motor for supplying the material to said machine, and means responsive to predetermined maximum watts taken by said first named motor for causing said second named motor to decrease the supply of material to said machine and responsive to predetermined minimum watts taken by said first named motor for causing said second named motor to increase the supply of material to said machine.

10. The combination with a machine for treating material, of an electric motor for driving said machine, a second motor for supplying material to said machine, and means responsive to predetermined maximum watts taken by said first named motor for automatically stopping said second named motor for decreasing the supply of material to said machine and responsive to predetermined minimum watts taken by said first named motor for automatically starting said second named motor for increasing the supply of material to said machine.

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