April 7, 1953 K. MacDONALD 2,633,857

GOVERNOR STEAM CONTROL AND EMERGENCY VALVE FOR STEAM TURBINES

Filed July 6, 1949 2 SHEETS—SHEET 1

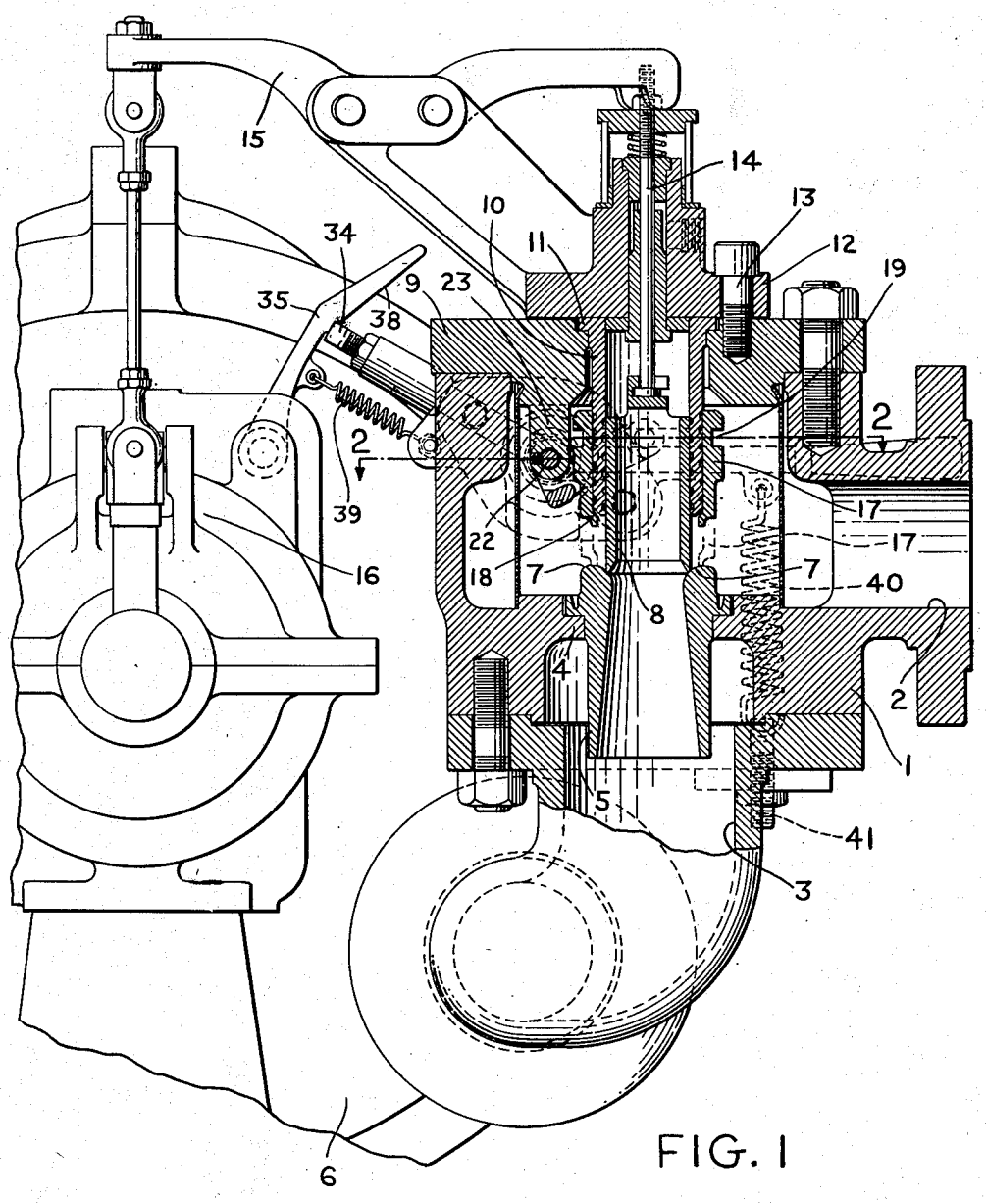


FIG. 1

KARL MACDONALD
INVENTOR.

BY Robert Meyer
attorney

April 7, 1953 K. MacDONALD 2,633,857

GOVERNOR STEAM CONTROL AND EMERGENCY VALVE FOR STEAM TURBINES

Filed July 6, 1949 2 SHEETS—SHEET 2

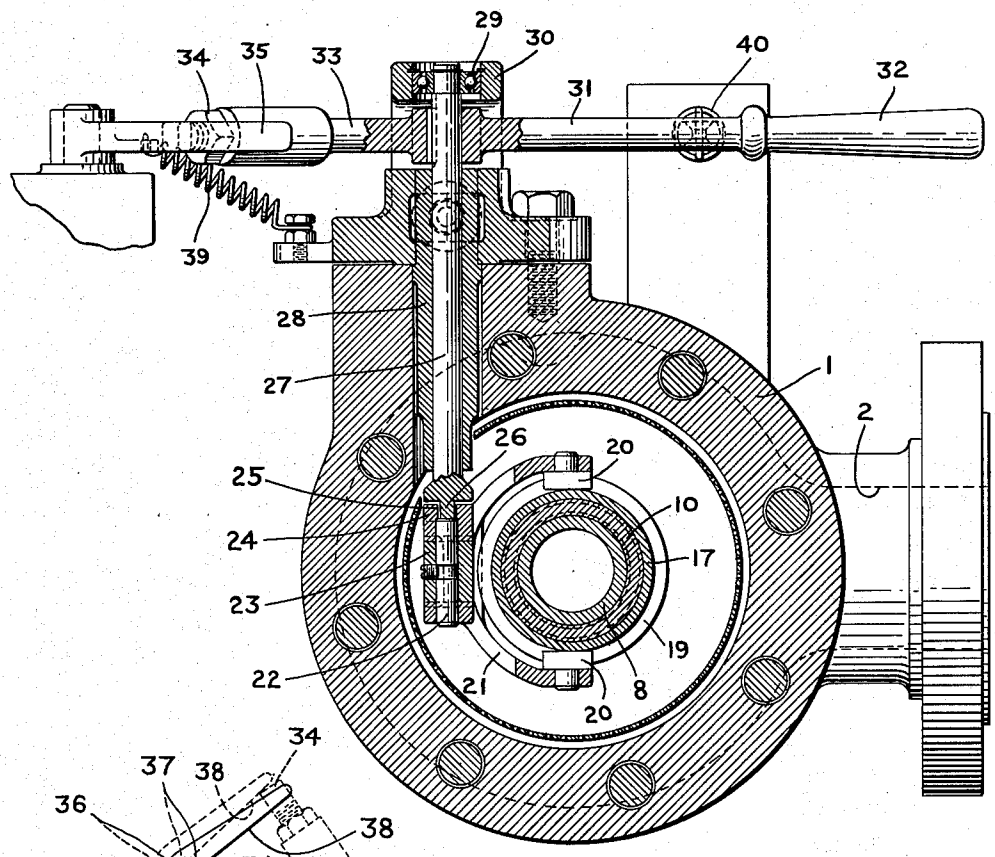


FIG. 2

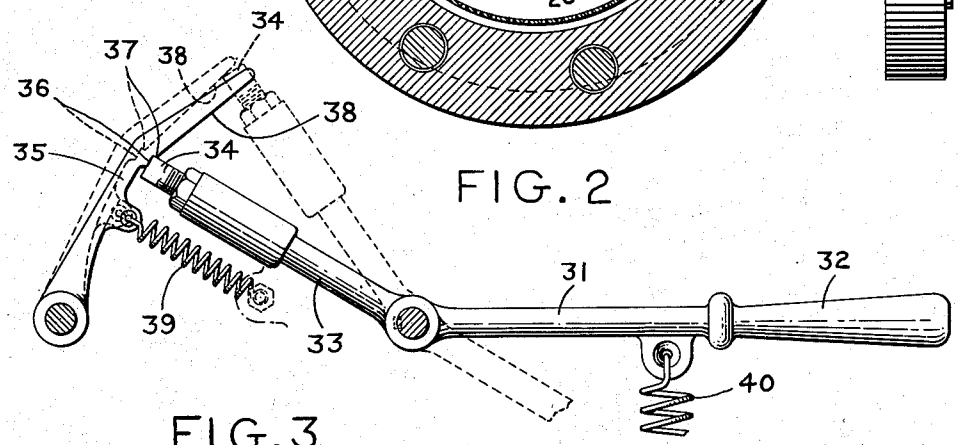


FIG. 3

KARL MACDONALD
INVENTOR.

BY Robert Kleeger
attorney

Patented Apr. 7, 1953 2,633,857

UNITED STATES PATENT OFFICE

2,633,857

GOVERNOR STEAM CONTROL AND EMERGENCY VALVE FOR STEAM TURBINES

Karl MacDonald, Wellsville, N. Y., assignor to Worthington Corporation, Harrison, N. J., a corporation of Delaware

Application July 6, 1949, Serial No. 103,211

12 Claims. (Cl. 137—49)

1

This invention relates to steam inlet control valves for steam turbines and, more particularly, to a governor steam control valve and an emergency valve for cutting off the supply of steam to a turbine in emergencies.

The present invention comprises a Venturi governor valve for steam turbines including a Venturi tube valve seat, a cylindrical governor valve for setting thereon, a guiding sleeve for guiding movement of the governor valve and a cylindrical or sleeve-like emergency valve slidably mounted on the guiding sleeve and setting on the Venturi tube valve seat, together with suitable mechanisms for operating the governor valve and the emergency valve.

Such a construction and arrangement of the governor and emergency valves has many advantages, among which are comparatively simple and easy machining operations in their construction; ease and convenience of assembly and repair; less drop in pressure of the steam entering the turbine due to the fact that the steam passes through one valve only in contradistinction to passing through the openings for two valves as in the conventional separate and independent governor valve and emergency valve now in use; eliminates the need of a pilot valve such as is required to relieve pressure on the top of the separate and independent emergency valve together with reduction of impact shock on the valve seat; reduction of friction in the operating parts of the valve over that of a reciprocating type of valve stem and operating means with resultant less pressure on the valve operating mechanism and leaving all the energy of the closing spring to close the valve thus providing freer, sharper closing action of the valve, together with other advantages as will appear from the following specification.

With these and other objects in view, as may appear from the accompanying specification, the invention consists of various features of construction and combination of parts, which will be first described in connection with the accompanying drawings, showing a governor steam control and emergency valve for steam turbines of a preferred form embodying the invention, and the features forming the invention will be specifically pointed out in the claims.

In the drawings:

Figure 1 is a vertical section through the improved governor steam control and emergency valve for steam turbines.

Figure 2 is a horizontal section through the governor steam control valve and emergency valve taken on the line 2—2 of Figure 1.

2

Figure 3 is a detail fragmentary view showing the manually operated lever for controlling operation of the emergency valve.

Referring more particularly to the drawings, the improved governor steam control and emergency valve structure for steam turbines includes a valve housing 1 having a steam inlet 2 and a steam outlet 3 to the turbine.

The housing 1 has a seat 4 formed therein between the inlet 2 and outlet 3 on which is supported a Venturi valve seat 5 through which the steam passes to the turbine, a fragment of which is indicated at 6. The upper valve seat surface 7 of the venturi 5 may be rounded as shown in Figure 1 of the drawings and forms a seat against which the end of the cylindrical or sleeve-like governor valve 8 seats.

The housing 1 has one end open which open end is closed by a cover head 9. The cover head 9 has an opening therein through which the governor valve guiding sleeve 10 extends, and in the drawings the sleeve 10 is shown as provided with an annular shoulder 11 which is clamped between a companion shoulder formed on the cover head 9 and surrounding its central opening and the clamping member 12 which is attached to the cover head in any suitable manner such as by bolts 13. The governor valve 8 reciprocates within the valve guiding sleeve 10 and is operated from or through the stem 14 by any suitable, usual or approved type of valve operating mechanism 15 from the governor structure 16 of the turbine.

The emergency steam cutoff valve comprises a cylindrical or sleeve-like valve 17 which is slidably mounted upon the valve guiding sleeve 10. As shown in Figure 1 of the drawings, the governor valve 8 is mounted within the valve guiding sleeve 10 while the emergency valve 17 is mounted upon the outside of the valve guiding sleeve 10. The emergency valve 17 when in closed position rests upon a portion of the rounded seat 7 of the venturi 5 as shown in dotted lines of Figure 1 of the drawings. An annular shoulder 18 is formed on the emergency valve 17 near its lower valve seat contacting end which shoulder, engaging the end of the valve guiding sleeve 10 forms a stop for limiting the opening movement of the emergency valve and also permits the internal offsetting of the seat engaging end of the emergency valve so as to provide proper steam balancing of the emergency valve.

The emergency valve 17 has an annular groove 19 formed therein which engages sliding trunnions 20 formed thereon and which project radially therefrom. A rocking yoke 21 is pivotally

connected to the trunnions 20 and is rockably supported on a stub shaft or pin 22 carried by a projection 23 formed upon and depending from the inner surface of the cover head 9. One end of the bearing barrel 24 of the rocker yoke 21 has a longitudinally extending keyway 25 cut therein which loosely receives a flat key 26 formed upon the end of a rotary stem 27. The stem 27 is rotatably supported by a suitable sleeve 28 carried by the valve housing 1 and projects laterally out of the housing having its outer end supported in a ball bearing structure 29 carried by a bracket 30 formed on the valve housing.

A manually operated emergency valve operating or controlling lever 31 is mounted upon the rotary stem 27 for rotating the stem by rocking movement of the lever. The lever 31 has a handle 32 formed thereon and a latching extension 33 formed thereon and extending in the opposite direction from the stem 27 to the handle 32. As shown in Figure 3 of the drawings, the latching extension 33 inclines at an acute angle to the handle carrying section of the lever 31 and it has a stop member 34 adjustably carried thereby which cooperates with a pivoted latch 35. The latch 35 is pivotally supported in a suitable manner from a suitable portion of the turbine structure as shown in Figure 1 of the drawings, and it has a flat portion 36 formed thereon terminating in a shoulder 37 against which the adjustable stop 34 engages to hold the lever 31 and the emergency valve 17 in its furthest open position. The latch 35 has an inclined flat surface extension 38 extending outwardly from the shoulder 37 over which the stop 34 rides during movement of the valve 17 into closed position. A spring 39 is connected to the latch 35 and to the valve housing for urging the latch towards the adjustable stop 34, at all times.

A valve closing spring 40 is connected to the lever 31 between its point of mounting on the stem 27 and the handle 22. The spring 40 is connected by means of an adjustable stud 41 to the valve housing to permit regulation of the tension of the spring.

During normal operation of the valve structure, the governor valve 8 is raised and lowered by its operating mechanism 15 to provide governor control of the delivery of steam to the turbine (not shown). In the case of emergency the latch 35 is disengaged from stop 34 allowing the valve setting spring 40 to act downward on lever 31 which will move the emergency valve 17 quickly and positively into engagement with the valve seat 7 of the venturi 5 forming an emergency cut off of the delivery of steam to the turbine. During the seating movement of the emergency valve 17 the stop 34 rides over the surface 38 of the latch 35 to approximately the position shown in dotted lines in Figure 3 of the drawings. When it is desired to open the emergency valve and permit operation of the turbine under action of the governor valve 8 the lever 31 is moved in the opposite direction, tensioning the spring 40, and when the adjustable stop 34 reaches the flat 36 and shoulder 37 the emergency valve 17 will be latched or locked in its open position.

It will be understood that the invention is not to be limited to the specific construction or arrangement of parts shown, but that they may be widely modified within the invention defined by the claims.

What is claimed is:

1. In a governor steam control and emergency cutoff valve for steam turbines, a valve housing, a cylindrical valve guiding sleeve removably carried by said housing, a cylindrical governor valve slidably mounted within said sleeve, means for operating said governor valve, a Venturi valve seat in said housing for cooperation with said governor valve, said Venturi valve seat having a steam passage therethrough, said housing having an inlet and an outlet for steam communicating with the passage in said Venturi valve seat, a cylindrical emergency valve slidably mounted upon the outside of said valve guiding sleeve, said governor valve and said emergency valve adapted to engage said Venturi valve seat to cut off flow of steam therethrough, a rockable lever, means connecting said lever to said emergency valve, a seating spring connected to said lever for moving the emergency valve into closed seated position, said lever movable to move the emergency valve into open position, an adjustable stop carried by said lever, and a latch cooperating with said adjustable stop for holding said emergency valve in open position.

2. In a governor steam control and emergency cutoff valve for steam turbines, a valve housing having an inlet and an outlet for steam, a governor operated valve in said housing, a valve seat having a steam passage therethrough, a guiding sleeve for guiding movement of said governor operated valve into and out of engagement with said valve seat, an emergency cutoff valve slidably carried by said sleeve for movement into and out of engagement with said seat, manually operated means for moving said emergency valve, a spring connected to said manually operable means for moving said emergency valve towards closed position, and means engaging said manually operable means for locking said emergency valve in full open position.

3. A governor steam control and emergency cutoff valve for steam turbines as claimed in claim 2 wherein said emergency valve has an annular shoulder formed upon its valve seat engaging end for engagement with said guiding sleeve to limit opening movement of the emergency valve.

4. A governor steam control and emergency cutoff valve for steam turbines as claimed in claim 2 wherein said emergency valve is a sleeve valve having its ends exposed to pressure of steam in the valve housing, an annular shoulder formed upon the valve seat engaging end of said sleeve emergency valve for engagement with said guiding sleeve to limit opening movement of the emergency valve, said annular shoulder being offset to provide steam balancing of the emergency valve.

5. A governor steam control and emergency cutoff valve for steam turbines as claimed in claim 2 wherein said manually operated means constitutes a lever, a rocker yoke connected to said emergency valve, means rockably supporting said yoke, and means connecting said lever and yoke for rocking the yoke by movement of the lever.

6. A governor steam control and emergency cutoff valve for steam turbines as claimed in claim 2 wherein said manually operated means constitutes a lever, a rocker yoke connected to said emergency valve, means rockably supporting said yoke, and means connecting said lever and yoke for rocking the yoke by movement of the lever, and wherein said locking means comprises a pivoted latch, and a spring for urging said latch in locking engagement with said lever.

7. In a governor steam control and emergency

cutoff valve for steam turbines, a valve housing having an inlet and outlet for steam and having one end open, a cover head for said open end, a valve seat in said housing between said steam inlet and outlet, a valve guiding sleeve carried by said cover head, a governor operated valve slidably mounted in said sleeve for contact with said valve seat, an emergency steam cutoff valve slidably mounted on said sleeve for seating engagement with said valve seat, means for operating said governor operated valve, means for operating said emergency valve, means for locking the emergency valve in open position, said locking means operable to release the emergency valve operating means to allow full closing movement of the emergency valve, and a valve seating spring connected to said emergency valve operating means for seating the emergency valve upon release of said locking means.

8. A governor steam control and emergency cutoff valve for steam turbines as claimed in claim 7 wherein said emergency valve operating means includes a manually operated lever, a rocker yoke carried by the emergency valve, means carried by said cover head for rockably supporting said yoke, and means connecting said lever and yoke for rocking the yoke upon movement of the lever.

9. A governor steam control and emergency cutoff valve for steam turbines as claimed in claim 7 wherein said emergency valve operating means includes a manually operated lever, a rocker yoke carried by the emergency valve, means carried by said cover head for rockably supporting said yoke, and means connecting said lever and yoke for rocking the yoke upon movement of the lever, means formed upon said emergency valve for engagement with said guiding sleeve to limit opening movement of said emergency valve.

10. A governor steam control and emergency cutoff valve for steam turbines as claimed in claim 7 wherein said emergency valve operating means includes a manually operated lever, a rocker yoke carried by the emergency valve, means carried by said cover head for rockably

supporting said yoke, a rotary stem carried by said valve housing and connected to said lever, said yoke provided wth a slot, a key on said rotary stem engaging in said slot for providing limited lost motion between movement of the lever and yoke upon initial movement of the lever.

11. A governor steam control and emergency cutoff valve for steam turbines as claimed in claim 7 wherein said emergency valve operating means includes a manually operated lever, a rocker yoke carried by the emergency valve, means carried by said cover head for rockably supporting said yoke, and means connecting said lever and yoke to permit limited lost motion between the lever and yoke upon initial movement of the lever.

12. A governor steam control and emergency cutoff valve for steam turbines as claimed in claim 7 wherein said emergency valve operating means includes a manually operated lever, a rocker yoke carried by the emergency valve, means carried by said cover head for rockably supporting said yoke, and means connecting said lever and yoke to permit limited lost motion between the lever and yoke upon initial movement of the lever, said emergency valve being a sleeve valve exposed to pressure of steam in the housing, an annular shoulder formed upon the valve seat engaging end of said emergency valve for engagement with said guiding sleeve to limit opening movement of the emergency valve, said annular shoulder being offset to provide steam balancing of the emergency valve.

KARL MACDONALD.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
706,616	Watson	Aug. 12, 1902
714,982	Widmayer	Dec. 2, 1902
940,815	Moore	Nov. 23, 1909
1,831,713	Knowlton	Nov. 10, 1931