J. F. DEEMS & W. V. TURNER.

STEAM CONTROLLING APPARATUS.

APPLICATION FILED MAY 16, 1912.

1,063,664.

Patented June 3, 1913.

2 SHEETS—SHEET 1.

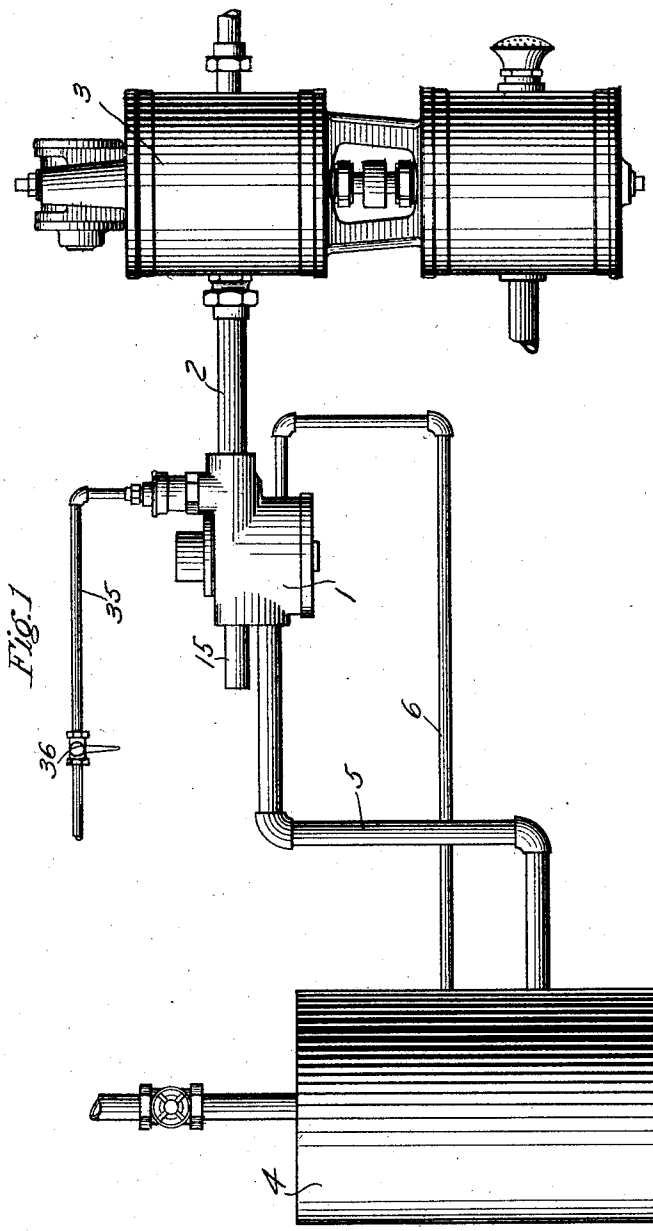


Fig. 1

WITNESSES

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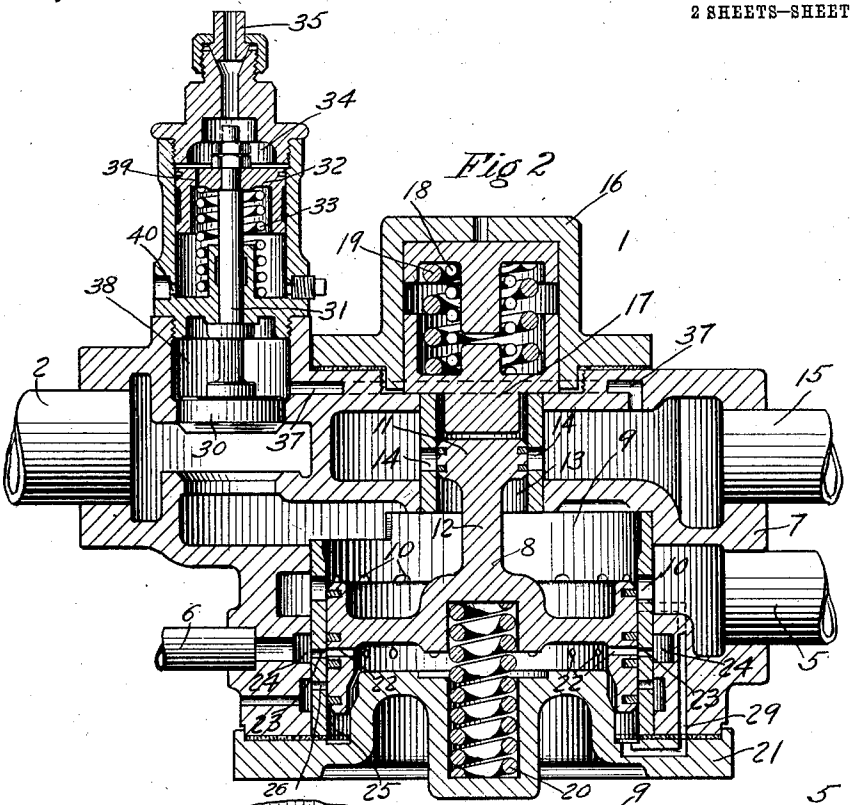


Fig. 2

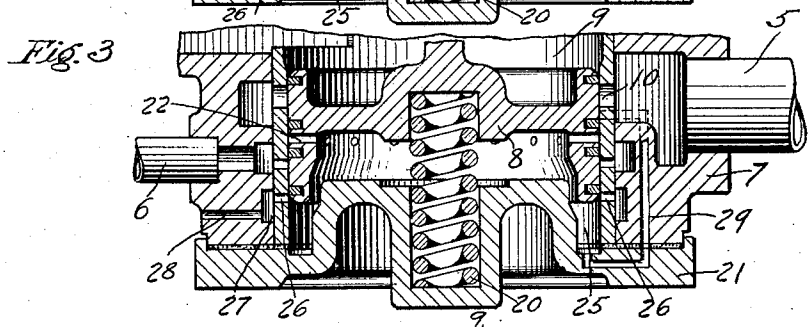


Fig. 3

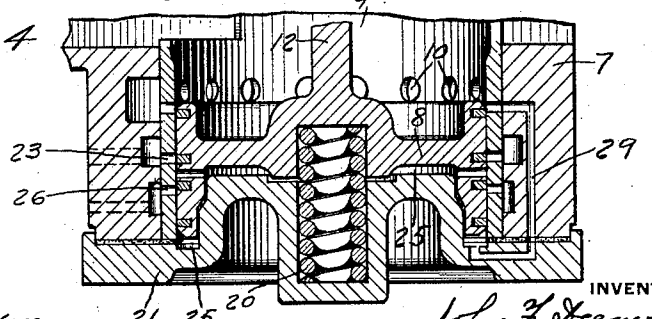


Fig. 4

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UNITED STATES PATENT OFFICE.

JOHN F. DEEMS, OF BURLINGTON, IOWA, AND WALTER V. TURNER, OF EDGEWOOD, PENNSYLVANIA, ASSIGNORS TO ECONOMY CAR HEATING COMPANY, OF PORTLAND, MAINE, A CORPORATION OF MAINE.

STEAM-CONTROLLING APPARATUS.

1,063,664. Specification of Letters Patent. Patented June 3, 1913.

Application filed May 16, 1912. Serial No. 697,709.

To all whom it may concern:

Be it known that we, JOHN F. DEEMS, a citizen of the United States, and a resident of Burlington, in the county of Des Moines and the State of Iowa, and WALTER V. TURNER, a citizen of the United States, and a resident of Edgewood, in the county of Allegheny, in the State of Pennsylvania, have invented certain new and useful Improvements in Steam-Controlling Apparatus, of which the following is a specification.

This invention relates to improvements in apparatus for controlling steam so that the same may be utilized for heating and various other purposes.

One feature of this invention relates to improvements in apparatus preferably adapted to be used in connection with a steam pump on a locomotive whereby the exhaust steam from the pump may be stored and subsequently utilized for heating the vehicles composing a train. In such apparatus it is desirable to store the steam from the pump during the first portion of the exhaust and to allow the steam to flow directly to the atmosphere during the last portion of the exhaust.

This invention is for an improvement over a construction which comprises, broadly stated, means for supplying steam, a by-pass device connected thereto, a storage receptacle or reservoir, said by-pass device having two outlets, one outlet leading to the atmosphere and the other connected to said reservoir, and a conduit leading from the reservoir back to the by-pass device. In such prior constructions the by-pass device has been provided with a differential piston moved in one direction by the incoming steam engaging one face thereof, and moved in the other direction by steam from the reservoir engaging the other face thereof, and so arranged that the flow of incoming steam will be directed either to the reservoir or to the atmosphere, depending upon the conditions existing within the by-pass device. Heretofore, the flow of steam from the reservoir to the by-pass device has been either unrestricted, or controlled by an independent auxiliary valve located in the return conduit, arranged to be opened by the piston when approaching one limit of its movement, whereby reservoir steam will be admitted to one side of the piston to effect its movement. While such prior constructions have operated satisfactorily, yet there is a liability of a sufficient leakage of steam past the auxiliary valve to cause more or less pounding to take place within the by-pass device. Moreover, this auxiliary valve comprises several small operating parts, any one of which is liable to break or to become injured.

One of the objects of this invention is to have the conduit returning from the reservoir communicating through the side wall with the piston-containing chamber whereby the piston itself, when it moves, may operate to open and close the conduit, thereby serving as a valve, thus eliminating the independent auxiliary valve heretofore used. In order to accomplish this purpose the piston is preferably provided with a port which will be in communication with the return conduit when the piston is in one position only.

A further object of the invention is to provide the piston casing with a small passageway, leading from the piston chamber directly to the atmosphere, adapted to be closed at the time when the return conduit is open, and opened soon after the piston is caused by the reservoir steam to move against the pressure of the incoming steam. The opening of the passageway at this time allows the reservoir steam which is inclosed in the casing to escape directly to the atmosphere, thus decreasing the expansive effect of said steam and consequently eliminating the pounding which would result if said steam were not allowed to thus escape.

With the prior constructions it has also been found that occasionally the initial high pressure of the incoming steam admitted to one side of the piston will force the piston to an extreme position against the pressure of the steam from the reservoir admitted to the opposite side of the piston, at which time the piston may fail to move back so as to close the reservoir supply ports and open the atmospheric exhaust during the pump stroke. Another object of the invention therefore consists in providing means for preventing the piston from sticking in the manner above described. This is preferably accomplished by providing in the piston casing a small conduit which leads from one side of the piston to the other side thereof

when the piston is in the extreme position above referred to, whereby the incoming steam which normally engages the side of the piston having the smaller effective area, can flow to the chamber at the side having the greater effective area, thereby causing the piston to be operated.

Another object of the invention also relates to the construction of the by-pass device which is particularly adapted for the diverting and storing of steam.

Another object of the invention consists in providing means at the inlet side of the by-pass device, whereby said device can be cut out of action and the incoming steam will pass directly to the atmosphere.

A further object of the invention is to simplify the construction and reduce the cost of manufacture of apparatus for controlling steam.

In the accompanying drawings, Figure 1 is a diagrammatic view showing the improved exhaust steam by-pass valve device applied to a locomotive steam pump apparatus; Fig. 2 a central vertical section of the by-pass valve device, showing the parts in position for diverting the exhaust steam from the pump to the steam heating reservoir; Fig. 3 is a similar view, showing the parts in the position in which the exhaust steam is vented to the stack; and Fig. 4 is a similar view, in a slightly different plane, showing the parts in their extreme lower position.

In Fig. 1 of the drawings, the improved steam by-pass valve device 1 is shown connected by pipe 2 with the usual exhaust steam port of the locomotive steam pump 3 and with a heating or exhaust steam reservoir 4 by pipes 5 and 6.

In one embodiment of the invention, the apparatus as a whole comprises a source of steam supply 3, a by-pass device connected thereto by the pipe 2, said device having an outlet provided with the pipe 15 leading to the atmosphere and an outlet connected to the storage receptacle or reservoir 4 by the pipe 5, and a return conduit or pipe 6 leading from the reservoir 4 back to the by-pass device 1. The by-pass device is provided with a piston to control the flow of steam through the outlet leading to the storage receptacle or reservoir or through the outlet leading to the atmosphere and through the return conduit. The by-pass valve device 1 comprises a casing 7 having a piston chamber containing a main differential piston 8, the chamber 9 above the piston being connected to the pump exhaust steam pipe 2 and having a series of ports 10 communicating with the reservoir pipe 5 and controlled by the piston 8. A small piston 11 is connected by stem 12 to the main piston 8 thereby materially decreasing the effective area of one side of the piston 8. The small piston operates in piston chamber 13 and controls the ports 14 that lead from the piston chamber 13 to the stack exhaust pipe 15. Mounted in a cap 16 secured to the upper face of casing 7 is a buffer block 18 adapted to be engaged by the piston 11 on its upward movement, the movement of the buffer block being opposed by springs 18 and 19. A spring 20 is also interposed between the main piston 8 and the lower cap 21 of the by-pass device to assist in cushioning the downward stroke of the piston.

In operation, the parts will normally be in the position shown in Fig. 2 of the drawings, in which the piston 11 closes the stack exhaust ports 14 while the reservoir ports 10 are open to piston chamber 9. The exhaust steam from the pump is therefore free to flow to the reservoir pipe 5. In this position, ports 22 in the piston 8 register with ports 23 leading to an annular chamber 24 which communicates through pipe 6 with the reservoir, so that steam at reservoir pressure is admitted to chamber 25 below the piston 8. As is well known, the pressure of exhaust steam from the pump is highest at the beginning of a stroke and gradually diminishes during the stroke and consequently at a certain point in the stroke, the total pressure of the steam within the reservoir which acts on the under side of piston 8 will exceed the total exhaust steam pressure in chamber 9, and the piston is then actuated by this difference between the total pressures to close the reservoir ports 10 and open the stack exhaust ports 14 by the movement of the small piston 11.

In order to prevent violent movements of the piston, there are provided ports 26 leading from chamber 25 to an annular chamber 27 which is open to an atmospheric exhaust port 28. In the upward movement, when the ports 10 are closed, as shown in Fig. 3, and the stack exhaust ports 14 are partly open, the piston 8 is adapted to uncover the ports 26 so that fluid under pressure in chamber 25 below the piston 8 is vented to the atmosphere. The reduction in pressure thus produced quickly checks the upward movement of the piston, so that pounding is prevented. Upon the next stroke of the pump the high initial pressure of the exhaust steam acting in chamber 9 on piston 8 forces the same downwardly and again opens the reservoir supply ports 10, at the same time closing the stack exhaust ports 14.

It sometimes happens that when exhaust steam is admitted to the chamber 9 above piston 8 the pressure is sufficient to drive the piston to its extreme lower position against the pressure of the reservoir steam on the opposite side of the piston, and in this position the ports 22 are cut off from

the ports 33. The steam being thus cut off from the chamber 25 below the piston 8, the piston might occasionally stick in this position during a pump stroke and thus fail to operate as intended. In order to provide against this possibility, another feature of our invention consists in providing an additional port 29, adapted when the piston 8 moves to its extreme lower position, as shown in Fig. 4 of the drawings, to connect the chamber 9 with chamber 25. It will thus be evident that upon movement to the extreme lower position, steam is supplied through the port 29 to chamber 25 thus equalizing the steam pressures on opposite sides of the piston 8, so that the spring 20 can readily return the piston to its normal position.

In order to cut the by-pass valve device out of action when desired, a valve 30 may be provided for controlling communication from the exhaust outlet of the pump either to the chamber 9 of the by-pass valve device or directly to the stack. The valve 30 is connected by a stem 31 to a piston 32 subject on one side to the pressure of a spring 33 tending to maintain the valve in the open position for establishing communication from the exhaust steam pipe 2 to the chamber 9. The chamber 34 on the opposite side of piston 32 is connected to a pipe 35 containing a cock 36. The pipe 35 is connected to a suitable source of fluid pressure supply such as the main air reservoir on the locomotive and when the cock is turned to open position, fluid under pressure is supplied to the piston 32 to actuate the same against the resistance of the spring 33 and thereby operate the valve 30 to close communication from the exhaust steam pipe 2 to the chamber 9. This movement of the valve 30 also opens communication from pipe 2 to a cored passage 37 leading from chamber 38 to pipe 15, so that exhaust steam is now vented directly to the stack and the by-pass valve device is cut out. If the cock 36 is turned to its normal closed position the fluid under pressure in chamber 34 equalizes through port 39 in piston 32 to the chamber below the piston and thence escapes to the atmosphere through an exhaust port 40. Upon substantial equalization of fluid pressure on opposite sides of the piston 32, the spring 33 operates to return the piston 32 and the valve 30 to the normal open position, as shown in Fig. 2 of the drawings.

The improvements herein set forth are not limited to the precise construction and arrangement shown and described as they may be embodied in various forms and modifications without departing from the spirit and scope of the invention.

We claim as our invention:

1. In a steam controlling apparatus, the combination with a source of exhaust steam and a reservoir, of a piston subjected on one side to the flow of exhaust steam from said source for controlling the admission of exhaust steam to the reservoir and having ports for controlling the admission of steam from the reservoir to the opposite side of said piston.

2. In a steam controlling apparatus, the combination with a source of exhaust steam and a reservoir, of a piston subjected on one side to the flow of exhaust steam from said source for controlling ports through which exhaust steam is supplied to the reservoir, said piston having ports for admitting steam from the reservoir to the opposite side of the piston when the reservoir supply ports are open.

3. In a steam controlling apparatus, the combination with a source of exhaust steam and a reservoir, of a piston subjected on one side to the flow of exhaust steam from said source and having means adapted in one position of the piston to open communication for supplying exhaust steam to the reservoir and in another position to close said communication and open a communication to the usual exhaust, said piston having ports adapted in the first position to supply steam from the reservoir to the opposite side of said piston and in the second position to cut off said supply of steam.

4. In a steam controlling apparatus, the combination with a source of exhaust steam and a reservoir, of a piston subjected on one side to the flow of exhaust steam from said source for controlling the flow of exhaust steam to the reservoir, means for supplying steam from the reservoir to the chamber at the opposite side of said piston to operate said piston for cutting off the supply of exhaust steam to the reservoir upon a reduction in exhaust steam pressure, and ports for opening said chamber to the atmosphere upon movement of the piston to cut off the admission of steam to the reservoir.

5. In a steam controlling apparatus, the combination with a source of exhaust steam and a reservoir, of a piston subjected on one side to the flow of exhaust steam from said source for controlling the flow of exhaust steam to the reservoir and to the usual exhaust, ports for admitting steam from the reservoir to the chamber at the opposite side of the piston whereby it will move to cause a closing of the reservoir supply ports and to cause an opening of the usual exhaust upon a predetermined reduction in exhaust steam pressure, and whereby it can operate to cause an opening of other ports for venting said chamber to the atmosphere upon a further movement.

6. In a steam controlling apparatus, the combination with a source of exhaust steam and a reservoir, of a piston subjected on one side to the flow of exhaust steam from said

source for controlling ports adapted in one position of the piston to supply exhaust steam to the reservoir and in another position to vent exhaust steam to the atmosphere, ports for admitting steam from the reservoir to the chamber at the opposite side of the piston, when the reservoir supply ports are open, to cause said piston to close said supply ports and to open the atmospheric ports upon a predetermined reduction in exhaust steam pressure, and other ports for venting said chamber to the atmosphere, upon a further movement of said piston in which the ports for supplying steam to said chamber are closed.

7. In a steam controlling apparatus, the combination with a source of exhaust steam and a reservoir, of a piston subjected on the upper side to the flow of exhaust steam from said source for controlling the admission of exhaust steam to the reservoir, ports for admitting steam from the reservoir to the chamber at the opposite or lower side of said piston in one position of the piston, said ports being closed upon upward movement of the piston, and means for admitting steam from the upper or exhaust steam side of the piston to said chamber upon movement of the piston downward past the place where reservoir steam can flow into said chamber.

8. In a steam controlling apparatus, the combination with a source of exhaust steam and a reservoir, of a piston subjected on one side to the flow of exhaust steam from said source for controlling the admission of exhaust steam to the reservoir, ports controlled by said piston for admitting steam from the reservoir to the chamber at the opposite side of said piston upon movement of the piston to the position for supplying exhaust steam to the reservoir, and means for opening communication from one side of the piston to the other upon a further movement of the piston in which said ports are closed.

9. In a steam controlling apparatus, the combination of a source of supply, a by-pass device to which the supply is connected, a reservoir connected to the by-pass device, and a conduit leading from the reservoir to the device, said device comprising a casing containing therein a piston subjected on one side to the steam flowing into the device from the source of supply, said conduit leading from the reservoir to the device, terminating in a port in the side wall of the piston containing casing, the opening and closing of which port is controlled by the piston when it moves, the construction being such that when said port is open steam will exert a pressure against the other side of the piston.

10. The combination with a storage receptacle or reservoir, of a by-pass device having a piston to control the flow of steam from the device to the reservoir or to the atmosphere, a return conduit connecting the reservoir with the piston-containing chamber in the by-pass device and so arranged that the conduit will be opened and closed directly by the piston.

11. A by-pass device comprising a casing and piston movable therein, said casing provided with an inlet opening, two outlet openings and a return opening, the piston being arranged so as to control the flow of steam from one or the other of the outlet openings, the return opening communicating with the piston-containing chamber and so arranged that it is open when the piston is positioned to permit the steam to flow through one of the outlet openings and the piston constructed so that it will operate as a valve to close said return opening when the piston moves to close the last mentioned outlet opening and to open the other outlet opening.

12. A by-pass device comprising a casing and piston therein, said casing provided with an inlet opening, two outlet openings and a return opening, the piston being arranged so as to control the flow of steam from one or the other of the outlet openings, the return opening terminating in the walls of the piston containing chamber and arranged so that it is open when the piston is positioned to permit the steam to flow through one of the outlet openings and so that the piston operates as a valve to close said return opening when the piston moves to close the last mentioned outlet opening and to open the other outlet opening, the two outlet openings leading from the chamber at one side of the piston and the return opening leading to the chamber at the other side of the piston.

13. A steam controlling apparatus comprising in combination a source of steam supply, a by-pass device connected thereto, a reservoir connected to said device and a return conduit leading from the reservoir to said device, said device comprising a piston for controlling the flow of steam therefrom, the steam entering the said device engaging one side of the piston, and when the piston is in one position passing to the reservoir and when in a second position passing directly to the atmosphere, the return conduit communicating with the chamber at the other side of the piston for supplying steam to said chamber from the reservoir when the piston is in the first position, and a passageway to permit the flow of steam from said chamber to the atmosphere when the piston moves from the first position.

14. A by-pass device comprising a casing and a piston therein for controlling the flow of steam from said device, said casing having an inlet and two outlets leading from

the chamber at one side of the casing and a return opening leading to and a passageway leading from the chamber at the other side of the piston, the return opening being closed when the passageway is open and vice versa.

15. In a device of the class described the combination of a casing containing a differential piston, an inlet leading to and outlets leading from a chamber at one side of the piston, a return opening leading to the chamber at the other side of the piston, a passageway leading from said last-mentioned chamber to the atmosphere, and a small passageway leading from one of the chambers to the other, said passageway being open at the time when the return opening and the passageway leading to the atmosphere are closed.

16. In a device of the class described the combination of a casing having an inlet, two outlets, a return opening and piston operated means controlling the outlets and the return opening, the device being provided with a small passageway which establishes direct communication between opposite sides of the piston.

17. In a device of the class described the combination of a casing having an inlet, two outlets, a return opening and means comprising a differential piston controlling the outlets and the return opening, said casing having a small passageway to establish direct communication between opposite sides of the piston when the piston occupies one of its extreme positions.

18. A by-pass device provided with a piston, a casing containing the same, said casing having an inlet opening, two outlet openings controlled by said piston and means between the inlet and the piston whereby the steam can be caused to pass to one of the outlet openings without contacting with the piston or whereby the steam can be caused to flow in contact with and past the piston out through either one of the outlet openings dependent upon the position of the piston.

19. The combination with means for supplying steam, of a by-pass device, a reservoir connected to the by-pass device, a return conduit leading from the reservoir to the by-pass device, the by-pass device being provided with an opening leading to the atmosphere and a piston-operated valve for controlling the flow of steam through the outlet leading to the atmosphere and through the outlet leading to the reservoir, said by-pass device being also provided with means whereby the steam can pass directly to the atmosphere from the steam supply without engaging the piston of the device, said means also constructed so as to permit the steam engaging the piston to flow either to the outlet leading to the atmosphere or to the outlet leading to the reservoir, dependent upon the position of the piston.

This specification signed and witnessed the 3d day of May A. D. 1912, in the city of New York, in the State of New York.

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This specification signed and witnessed the 14th day of May A. D. 1912, in the borough of Wilmerding, in the State of Pennsylvania.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."