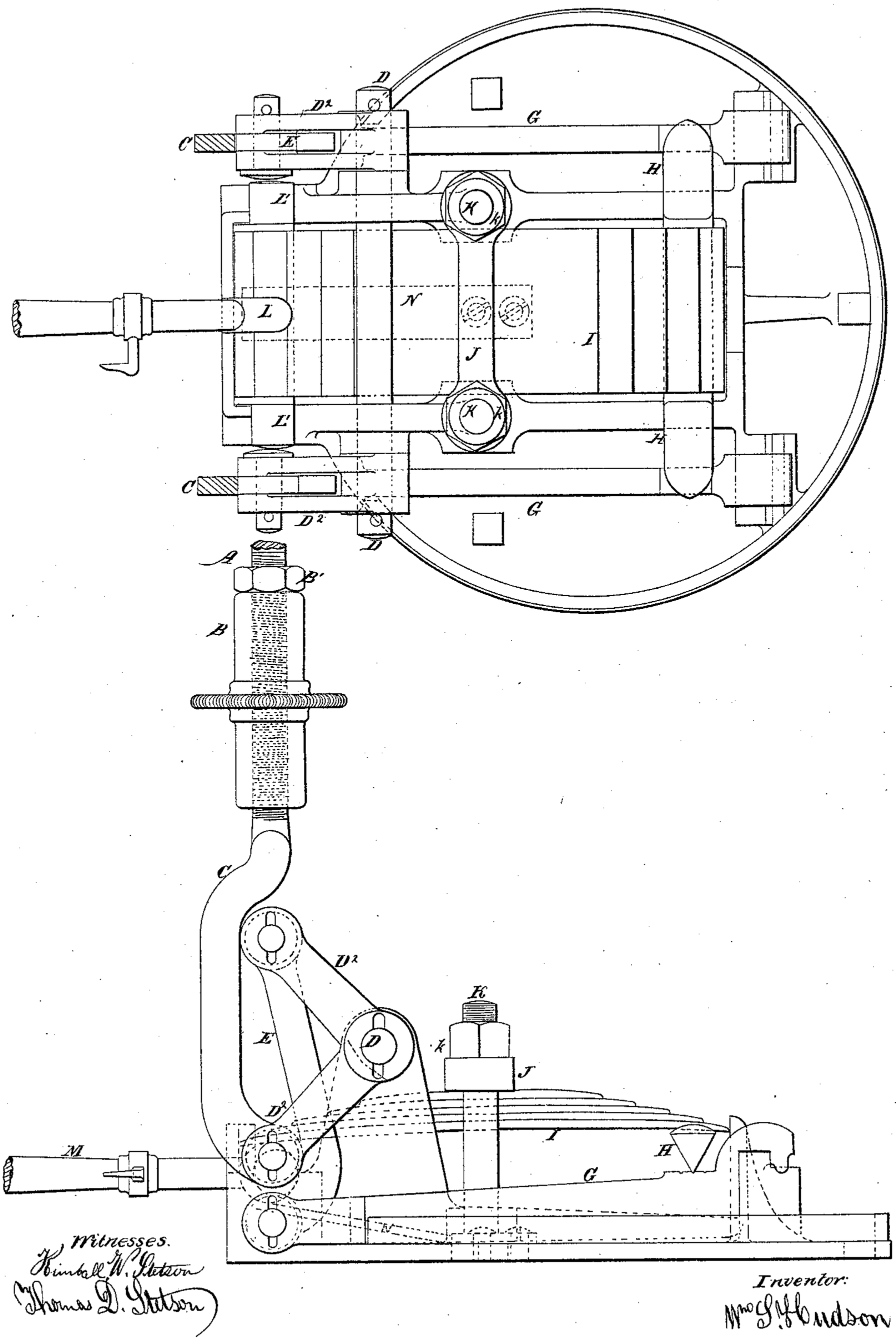
W. S. Hudson,

Operating Safety Valves.

No. 46,238. Patented Feb. 7, 1865.



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IMPROVED DEVICE FOR OPERATING SAFETY-VALVES.

Specification forming part of Letters Patent No. **46,238**, dated February 7, 1865.

To all whom it may concern:

Be it known that I, WILLIAM S. HUDSON, of Paterson, in the county of Passaic and State of New Jersey, have invented a certain new and useful Improvement in the Means for Operating Safety-Valves; and I do hereby declare that the following is a full and exact description thereof.

The accompanying drawings form a part of this specification.

Figure 1 is a plan view, and Fig. 2 a side elevation.

The figures show the parts containing the novelty, with so much of the other parts as are necessary to indicate their relation thereto.

Similar letters of reference indicate like parts in both the figures. Tints are employed to aid in distinguishing parts, and do not imply a difference in material. The material of the whole may be iron or steel.

My invention tends to reduce the probabilities of excessive pressure in a boiler. It is well known that safety-valves, when held down by the action of springs, do not perform in practice with the perfection theoretically ascribed to them, because when steam is generated rapidly, so that a large quantity must be discharged through the safety-valve, the safety-valve cannot rise sufficiently from its seat without changing the relation of the spring thereto. In other words, a safety-valve loaded by a spring, so as to lift at a given pressure when it rises to a considerable height from its seat, either experiences a greater resistance from the spring, and consequently calls for a still higher pressure of steam to hold it at that height, or there must be some peculiar provision for adapting it to this emergency.

Several inventions have been made for connecting the spring to the valve through the aid of bell-crank levers or other analogous devices so arranged that the leverage of the spring shall diminish as the valve rises. It is obvious that such arrangement may be carried to such an extent that the pressure required to sustain the valve at a suitable height above its seat, instead of being greater shall be actually less than that required to first start it from its seat. I employ such devices in my invention in combination with another device that recently patened to Charles Graham, patent dated 18th December, 1860.

My invention is very simple and effective, and possesses very marked advantages, particularly on locomotives. By its means the engineer may leave his engine in a tolerably safe condition, either with or without taking the precaution necessary with devices heretofore used. It is safer, and generally better, for obvious reasons, for the engineer to shift the handle before dismounting, especially if the fire is very intense and he expects to be absent any considerable period. In such case the safety-valve, which is ordinarily loaded to a pressure of, say, one hundred and ten pounds per square inch, will commence to blow off at one hundred or some other lower pressure, according as the device is constructed; but in case he should, through forgetfulness or other cause, dismount without such precaution, the safety-valve retains its seat, holding the boiler tight until the pressure of one hundred and ten pounds is reached. It will then relieve the boiler effectually, and will rise higher and higher to discharge great volumes of steam without accumulating any increased tension in the boiler.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation by the aid of the drawings and of the letters of reference marked thereon.

A, Fig. 2, is one of the threaded rods which descends from the ends of the ordinary safety-valve lever. (Not represented.) It will be understood that the two safety-valves act on said levers in the ordinary manner, so as to lift each of the rods A with a force corresponding to the pressure of the steam.

B is a right and left hand nut, and B′ an ordinary jam-nut.

C is a threaded rod, crooked as represented, and adapted to fit the lower part of the right and left nut, B.

D′ is the lower, and D^2 the upper arm of a bell-crank lever which is mounted on the fulcrum or shaft D, which is mounted in fixed centers, as represented.

There are two of the bell-crank levers D′ D^2, each mounted loosely on the shaft D, so that they may turn independently of each other to any extent required, and there are two safety-valves and safety-valve levers mounted independently, but near each other. The lever of each is held down by a rod, A C. There are, therefore, two of the rods A C.

The remaining parts to be described are represented in both drawings and involve the novelty of my invention.

E E are crooked links depending from the ends of the upper arms, D^2, of the bell crank lever before described. The lower ends of the links E are connected to the levers G. These latter levers turn on fixed centers or fulcra and transmit a powerful lifting force to the knife-edged cross-bar H H. The latter carries one end of the half-elliptic spring I. This spring is held down at its center by a suitable cross-bar, J, which may be adjusted at different hights, if necessary, by turning the nuts *k* on the bolts K. It is not intended to change the position of this cross-bar J after the apparatus has been properly constructed and adjusted, unless the tension of the spring should become changed, or it should become desirable to change the point at which the steam shall commence to blow off.

The forward end of the half-elliptic spring I, or that end thereof which is farthest removed from the bar H, rests on a shaft, L, which is adapted to turn on bearings L′, which are eccentric to the axis of the shaft L. These are mounted in fixed supports, as indicated. By turning the eccentric shaft L by means of the handle M, which is fixed thereto, the corresponding end of the half-elliptic spring I is raised or lowered at pleasure by the eccentric motion of the shaft L. The lever M is conveniently accessible to the engineer, so that he can at pleasure turn it down or up, and the spring I is notched, as indicated at *i*, to allow the lever to be lifted. When it is turned up out of the way, which is the ordinary condition under which the locomotive will work, the spring I is exercising its full proper tension, pressing down on the knife-edged cross-bar H, and consequently pressing downward the levers G G, and the connecting-links E and both arms D' D^2 of the bell-crank levers. It consequently holds down the two rods C A and the two connected main levers and safety-valves. (Not represented.)

When the end of the handle or lever M is pulled down and left in the position represented, or still lower, the forward end of the half-elliptic spring I is allowed to yield downward by reason of the eccentricity of the shaft L, and, as the cross-bar J remains stationary, the tension of the spring I on the cross bar H and the whole connected train referred to is lessened, so that the steam may lift the safty-valve and escape at a lower pressure than before. The engineer will ordinarily turn down the hand-lever M before leaving the locomotive. But in case he does not, or in any case, when the steam has arrived at a sufficient pressure, whether it be the full maximum pressure due to the elevated position of the hand-lever M or the reduced pressure due to its depressed position, it will rise. Now, the slightest vertical movement of the rod A C changes the leverage of the half-elliptic spring I by the change of the position of the two arms D' D^2 of each of the bell-crank levers. In other words, so soon as the safety-valves commence to rise and to deliver the steam, the act of rising by turning the bell-crank levers slightly on their center D causes the arm D' to assume a more nearly horizontal position and the arms D^2 to assume a more nearly perpendicular position. The consequence of this change will be readily recognized. The leverage at which the steam acts on the arms D' is increased by the change of position, and the leverage by which the spring I acts on the arms D^2 is decreased by said change. Consequently, the pressure which is sufficient to commence to lift the safety-valves will easily lift them to such height, by reason of this increased leverage, that any possible quantity of steam which can be generated in a given unit of time in the boiler will be delivered through the safety-valve without accumulating an increased pressure in the boiler. This result will obtain whatever may be the pressure at which the steam commences to lift the safety-valves.

N is a spring which presses upward against the under side of the eccentric shaft L. It serves to partially balance the hand-lever M, and thus to aid in sustaining it in any position desired, and by its friction prevents the lever from moving too readily.

Having now fully described my invention, what I claim as new in safety-valve arrangements, and desire to secure by Letters Patent, is—

The bell crank levers, in combination with the means L M, or their equivalents, for rapidly changing the initial tension of the spring I within wide limits, substantially as and for the purpose herein set forth.

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Witnesses:

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