

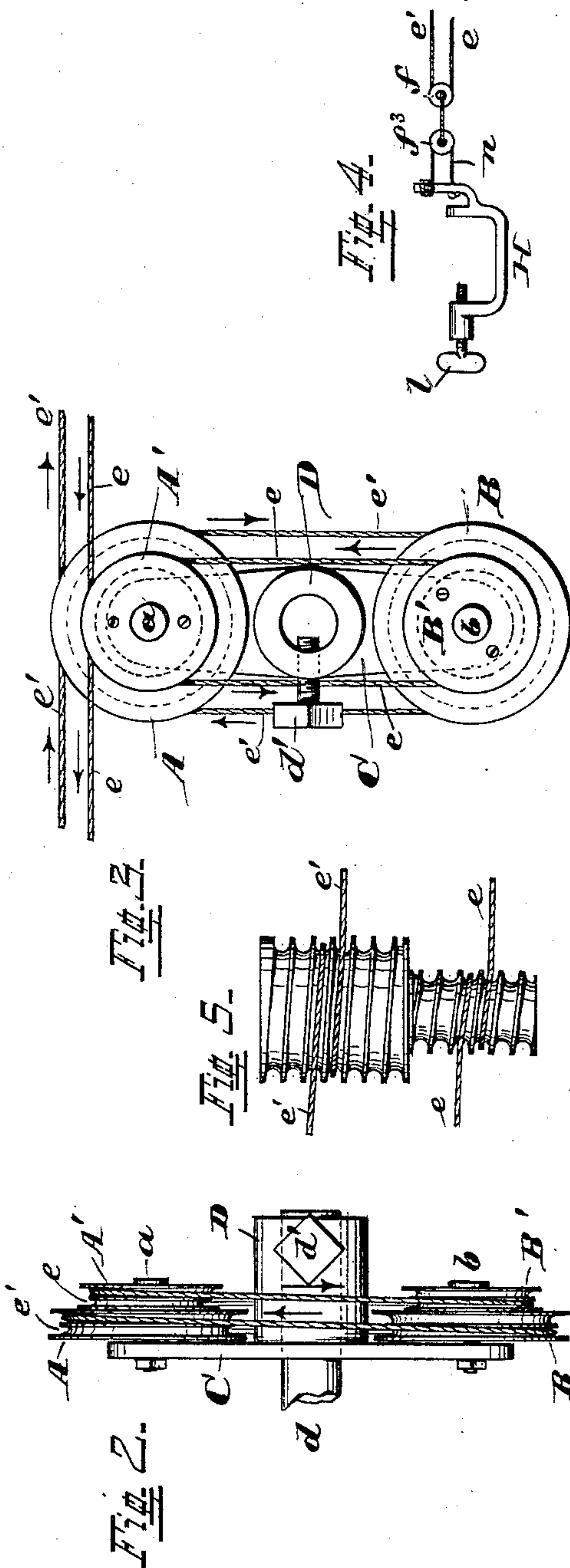
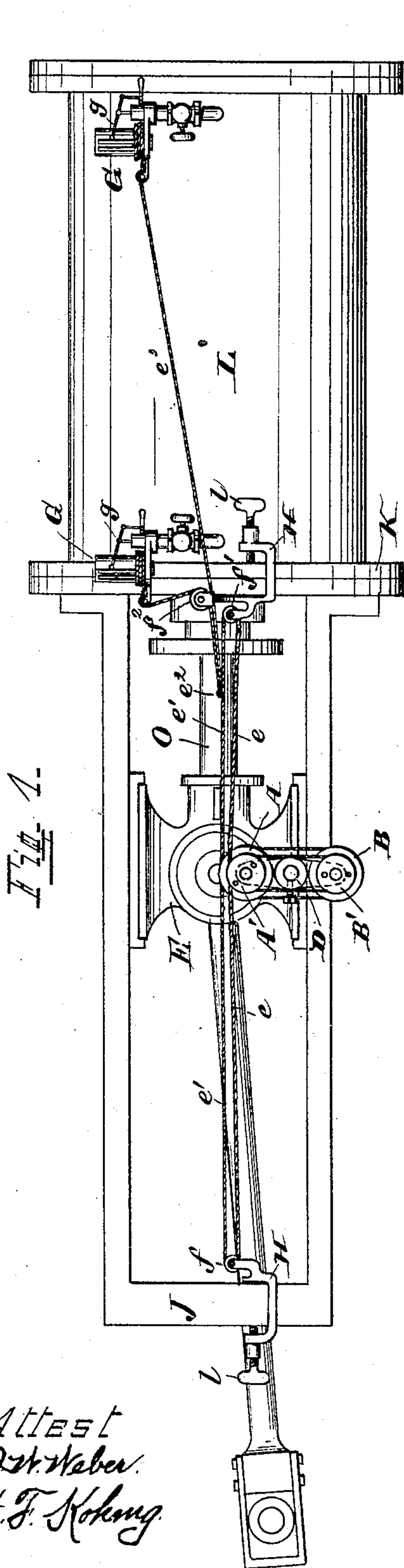
(No Model.)

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DEVICE FOR OPERATING STEAM ENGINE INDICATORS.

No. 441,142.

Patented Nov. 25, 1890.



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DEVICE FOR OPERATING STEAM-ENGINE INDICATORS.

SPECIFICATION forming part of Letters Patent No. 441,142, dated November 25, 1890.

Application filed May 24, 1890. Serial No. 352,982. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH D. DAVIES, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in a Device for Operating Steam-Engine Indicators, of which the following is a specification, reference being had to the accompanying drawings forming a part thereof.

The object of my invention is to provide an inexpensive and reliable device for operating the card-drum of any of the well-known indicators now in use for testing the operations and workings of an engine, said device to be connected to some reciprocating part thereof, preferably to the cross-head, as will more fully hereinafter appear.

In the accompanying drawings Figure 1 is a side elevation of my improved device in an operative position and connected to the cross-head of the engine, and is shown in a position to operate two indicators—a feature which can be readily accomplished when so desired. Fig. 2 is an edge view of the device shown in Fig. 1 on an enlarged scale, showing the preferable construction and location of the pulleys which travel on the indicator-cords when the former are connected to a reciprocating portion of the engine. Fig. 3 is a side elevation of the device shown in Fig. 2, the arrows indicating how the cord is applied to the pulleys. Fig. 4 shows a modification of the device for tightening the indicator-cord after having been put to place around the pulleys. Fig. 5 illustrates a modification of the device shown in Figs. 2 and 3, in which but one pulley need be employed, the latter having two faces of a different circumferential outline with helical grooves therein, in which the two portions of the endless indicator-cord travel as said pulley is carried forward and backward on the reciprocating portion of the engine.

The device as preferably constructed is made up of two pairs of pulleys A A' and B B', said pulleys being journaled on the spindles a b, the latter being made fast to the connecting-piece C. To the connecting-piece C is cast, or otherwise suitably secured a central sleeve D, which is adapted to fit over a suitable pin or lug d, made fast to the cross-head E, or other reciprocating portion of the engine, and

made fast thereto by means of the set-screw d'. As seen in the drawings one pulley in each pair of pulleys is smaller in circumferential outline than its adjacent mate. It is preferred, when constructed as shown in Figs. 1, 2, and 3, to have the two pulleys which go to make up each pair made fast together; but it is not necessary to have more than one pair thus connected, as the other pair of pulleys will necessarily travel at the same rate of speed. Each pulley is preferably provided with two or more grooves; but this is not necessary, for the lower pair of pulleys when applied as shown, as the indicator-cord passes around a portion only of the circumferential face of the lower pulleys, as shown in Fig. 3; but for the upper pulleys, where the same cord passes twice over the top portion of each pulley, it is preferred to have two or more grooves therein in which the cord may travel.

Having attached the above-described device to a reciprocating portion of the engine, the indicator-cord e e' is then applied as follows: The portion e of the cord shown in Fig. 3 is passed down over pulley A', around pulley B', and then up and over the top of pulley A', passing off in the same direction as first applied, as indicated by arrows. This cord e is next passed around the small pulley f, (see Fig. 1,) and after passing said pulley I shall denominate this same cord as e' for the purpose of illustration. The cord e' is then brought down over the top of pulley A, around a portion of pulley B, and up and over the top of pulley A in the direction indicated by arrow, the meeting ends of cord e e', after having been passed over the small pulley f', being united at the fixed point e², as shown in Fig. 1. The cord e³, which is connected to the indicator-drum G, is connected at its other end at any suitable point to either portion of the cord e e' and is shown as connected at the point e².

The small pulleys f and f' may be connected to any suitable stationary points on the engine and in any suitable manner. In the drawings I have shown said pulleys as being connected to an extension or arm of the adjustable brackets H, the latter being connected to the end of guide J and to the flange K of the steam-cylinder L by means of set-screws l l, a space being left between the ex-

tensions of said brackets and the guide and flange to permit of the cord $e e'$ being tightened through the medium of said set-screws.

The cord e^3 , attached to the indicator-drum, may lead direct to the connecting-point e^2 or pass around an additional small pulley f^2 , attached to the bracket H, as shown in Fig. 1, the latter being preferred.

The device is applicable to any of the well-known forms of indicators and is illustrated in connection with an indicator provided with a spring-drum G, around which the diagram-card is placed to receive the outline-marks of a pencil placed in the outer end of arm g in the usual manner.

In Fig. 4 I have shown a modification for tightening the cord $e e'$, the same consisting of two small pulleys f and f^3 , connected together, the pulley f^3 being connected to the arm of the bracket by means of a cord n , which latter may be drawn in tightly and wrapped around the bracket or otherwise suitably secured thereto, the object being to provide additional means for tightening the cord.

Having described the preferable construction of my device for operating the indicator-drum, I will now describe its operation.

As the cross-head E is forced outward and backward by means of the piston-rod O, the pulleys A A' B B' connected to said cross-head are carried forward and backward therewith, the continuous cord $e e'$ being wound onto and off said pulleys as the latter are carried to and fro. It is evident that if the pulleys were of equal circumferential surface they would travel over the cords $e e'$ without any horizontal movement of the latter in either direction; but it will be seen that the pulleys A' B' are of a smaller circumferential surface than pulleys A B, and hence the outer circumference of the latter travels faster than the outer circumference of the former, and in consequence the portion e' is wound onto and off the pulleys A B in one direction faster than the portion e is wound onto and off the pulleys A' B', thus causing the cord e to advance faster than the portion e' , the distance which cord e must advance or recede being governed by the difference in circumference between pulleys A and A'. For illustration, let us suppose pulley A to be eleven inches in circumference and pulley A' to be nine inches in circumference, the difference being two inches. The pulleys must be carried forward on the cross-head ten inches before pulley A has made one revolution and wound off in one direction eleven inches of cord e' , and while pulley A was winding off eleven inches of cord pulley A' wound off nine inches in the opposite direction, so that in a stroke of ten inches the cord e' has receded one inch at the fixed point e^2 and made a corresponding revolution of one inch of the indicator-drum. It will be readily seen that by this means I am enabled to correctly gage and indicate a long stroke with

but a slight movement of the indicator-cord, which movement is transmitted to the drum G of the indicator and correctly registered. It will also be seen that the point e^2 on the cord will move in either direction just one-half the difference in circumference between the small and large pulley, and in order to increase or diminish the diagram on the indicator-drum all that is required is simply to change the pulley A' for a smaller or larger one, according as it is desired to have the diagram increased or diminished.

While it is preferred to employ two pairs of pulleys, as aforesaid, but one pulley need be used, as shown in Fig. 5, the latter being made up of two cylinders having differing circumferential surfaces, each of which is provided with helical grooves, in which the cords $e e'$ may wind and unwind as said pulley is carried backward or forward.

Instead of having the cords $e e'$ attached to the pulleys $f f'$, as shown, the cord e' may be cut at each end and rigidly attached to the brackets. In this case the cord e is passed around the pulleys $f f'$ and over the pulleys A' B', but not over pulleys A B, said cord e being connected as at e^2 . By this construction twice the length of movement is given the indicator-cord over that previously described.

The advantages of my improved device are apparent. It is simple of construction, ready of application, and accurate in operation, and can be readily removed after having tested the engine. It will admit of taking a small diagram correctly of an engine having a long stroke, and by having two or more pulleys A' of varying diameters any length of stroke may be accommodated and correctly registered on a small card.

What I claim as new, and desire to secure by Letters Patent, is—

1. A device for operating the drum of an indicator, consisting of a pair of pulleys suitably connected to a reciprocating portion of the engine and suitable indicator-cords, said pulleys being of differing circumferential outlines and adapted to travel on said cords as said reciprocating portion of the engine is operated, substantially as set forth.

2. A device for operating the drum of an indicator, consisting of a pair of pulleys suitably connected to a reciprocating portion of the engine, one of said pulleys being adapted to travel at a circumferential velocity greater than that of its adjacent pulley when operated by said reciprocating portion, in combination with the indicator-cord $e e'$, arranged substantially as set forth.

3. A device for operating an indicator-drum, consisting of two pairs of pulleys A A' B B', suitably connected together and attached to a reciprocating portion of the engine, one pair of said pulleys A A' being connected together, the indicator-cord passing around said pulleys, as set forth, and

around the small pulleys $f f'$, the latter being suitably connected to stationary points, as and for the purposes set forth.

5 4. A device for operating the drum of an indicator, consisting of an endless cord $e e'$, a pulley connected to a reciprocating portion of an engine, pulleys $f f'$, and drum-cord e^3 , said cord $e e'$ passing around said pulley connected to the reciprocating portion of the engine and also around the pulleys $f f'$, the latter being attached to stationary points, the cord e^3 being connected to the endless cord at any desired point, for the purposes set forth.

15 5. A device for operating the drum of an indicator, the same consisting of pulleys attached to a reciprocating portion of the engine and an endless cord, said pulleys traveling on said cord, as set forth, and suitable means for tightening said cord, for the purposes specified.

6. In combination with a device for operating an indicator-drum, the same consisting of a pulley attached to a reciprocating portion of the engine, said pulley traveling on an endless cord, substantially as set forth, the means herein shown for securing said cord to stationary parts of the engine, the same consisting of brackets H and set-screws $l l$, substantially as set forth.

7. The device herein shown for operating the drum of an indicator, consisting of pulleys $A A' B B'$, spindles $a b$, connecting-piece C , sleeve D , and set-screw d' , all combined as set forth and connected to a reciprocating portion of the engine, in combination with the indicator-cord, substantially as set forth.

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Attest:

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