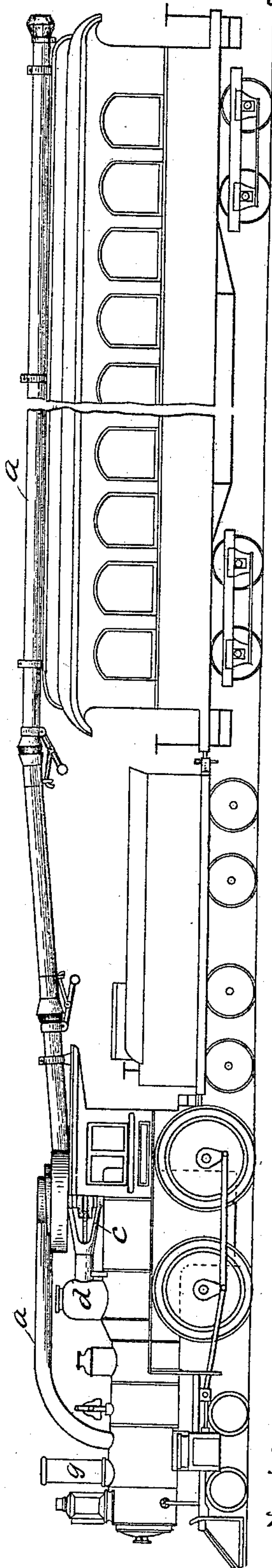
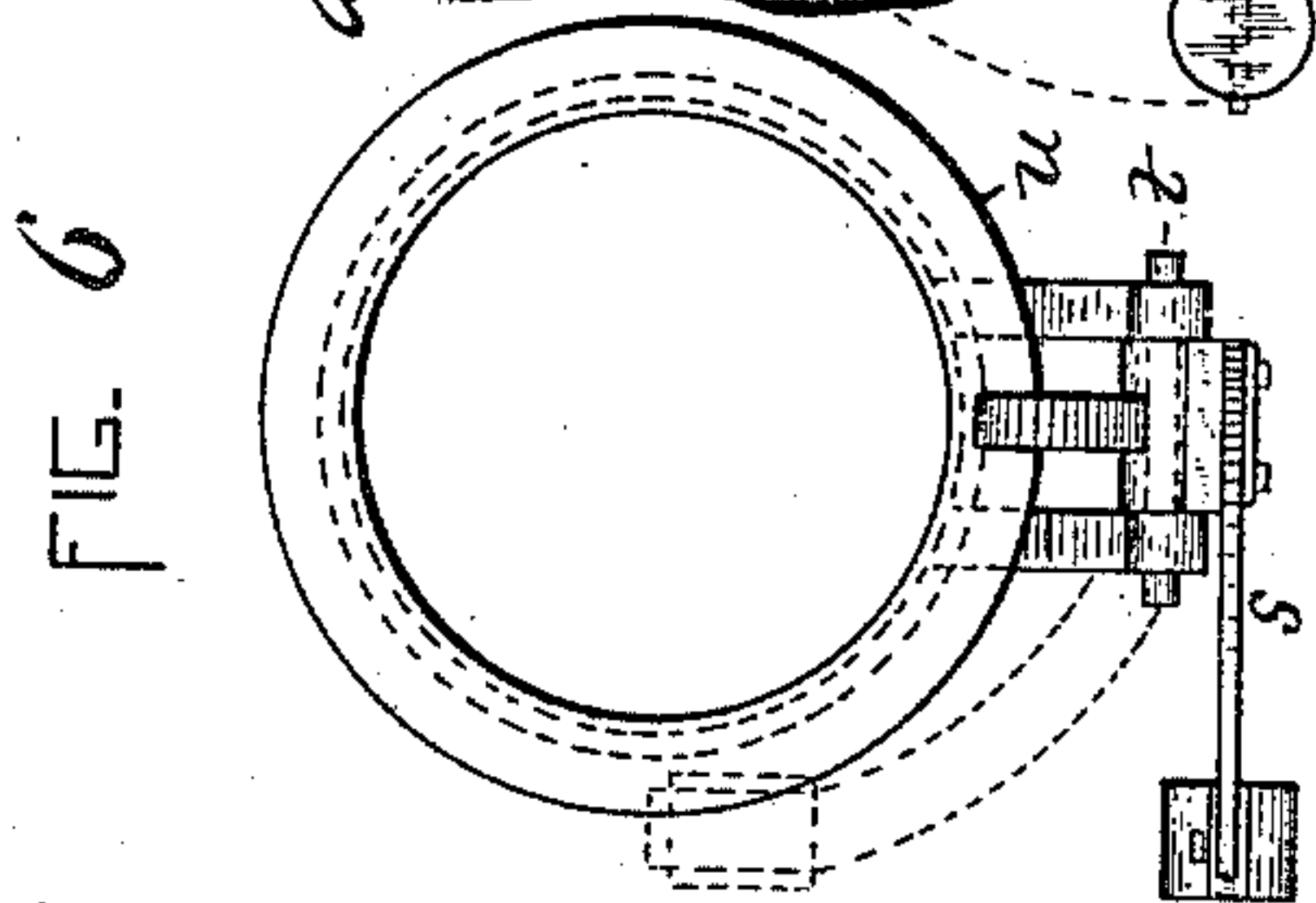
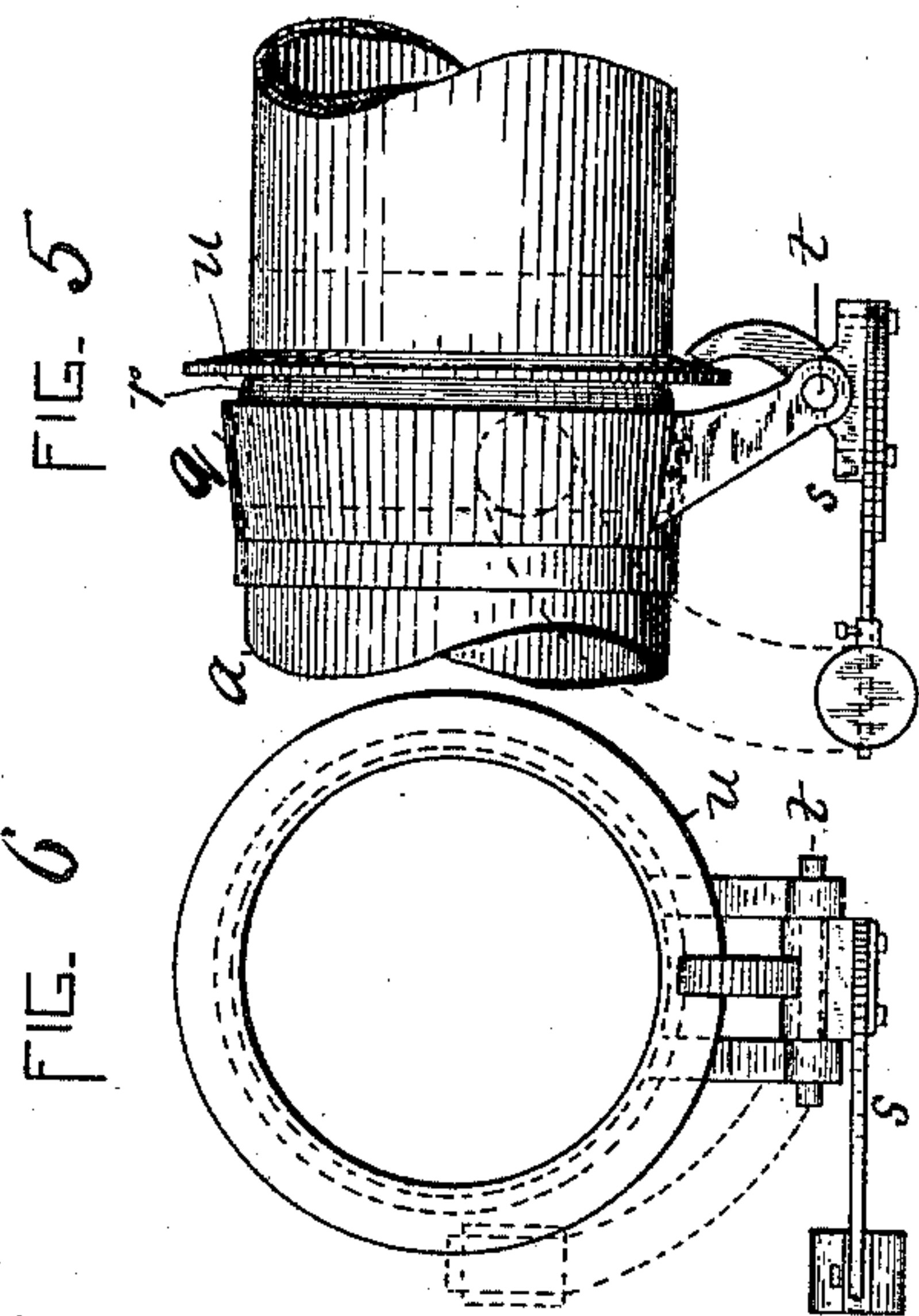
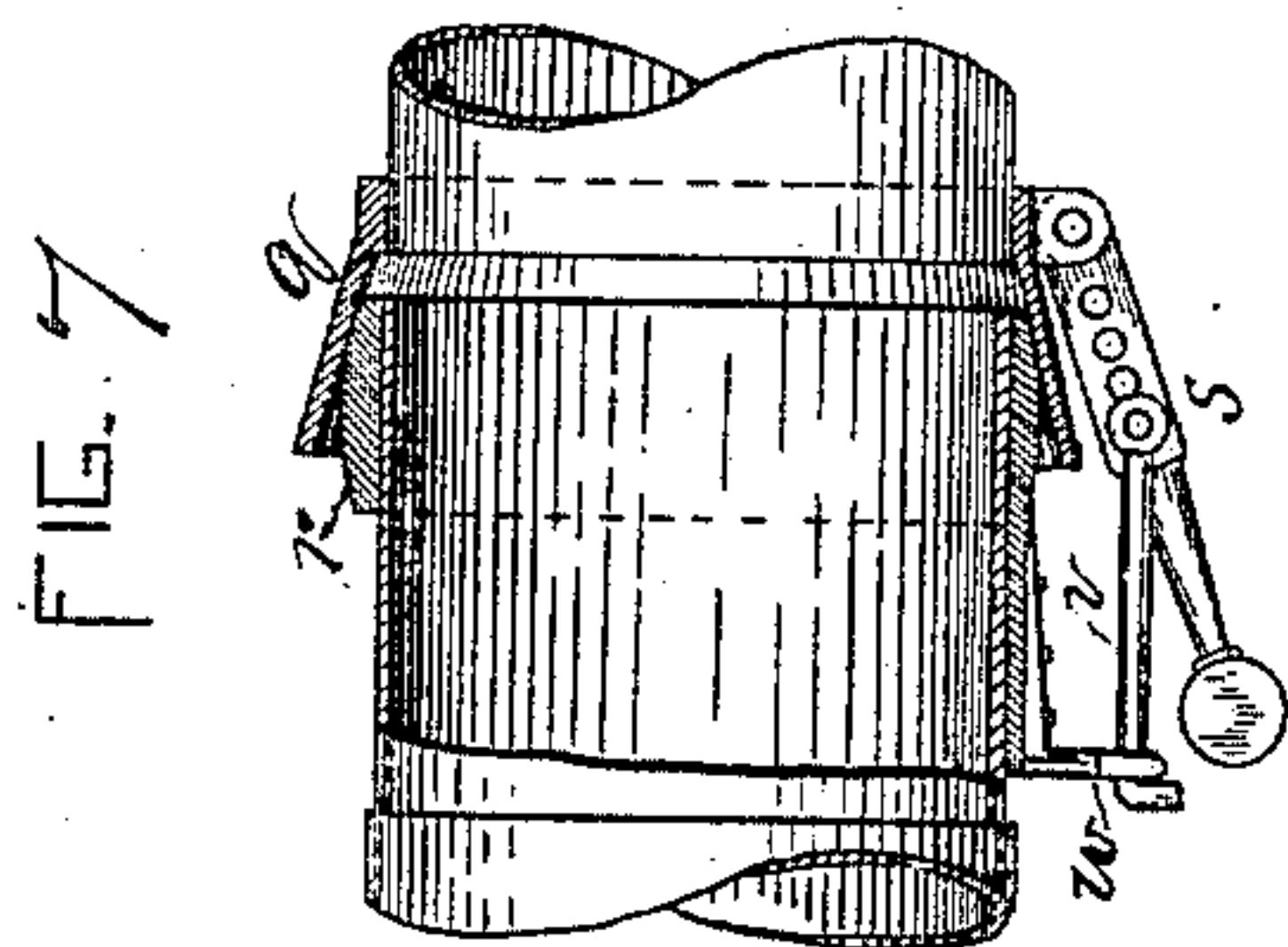
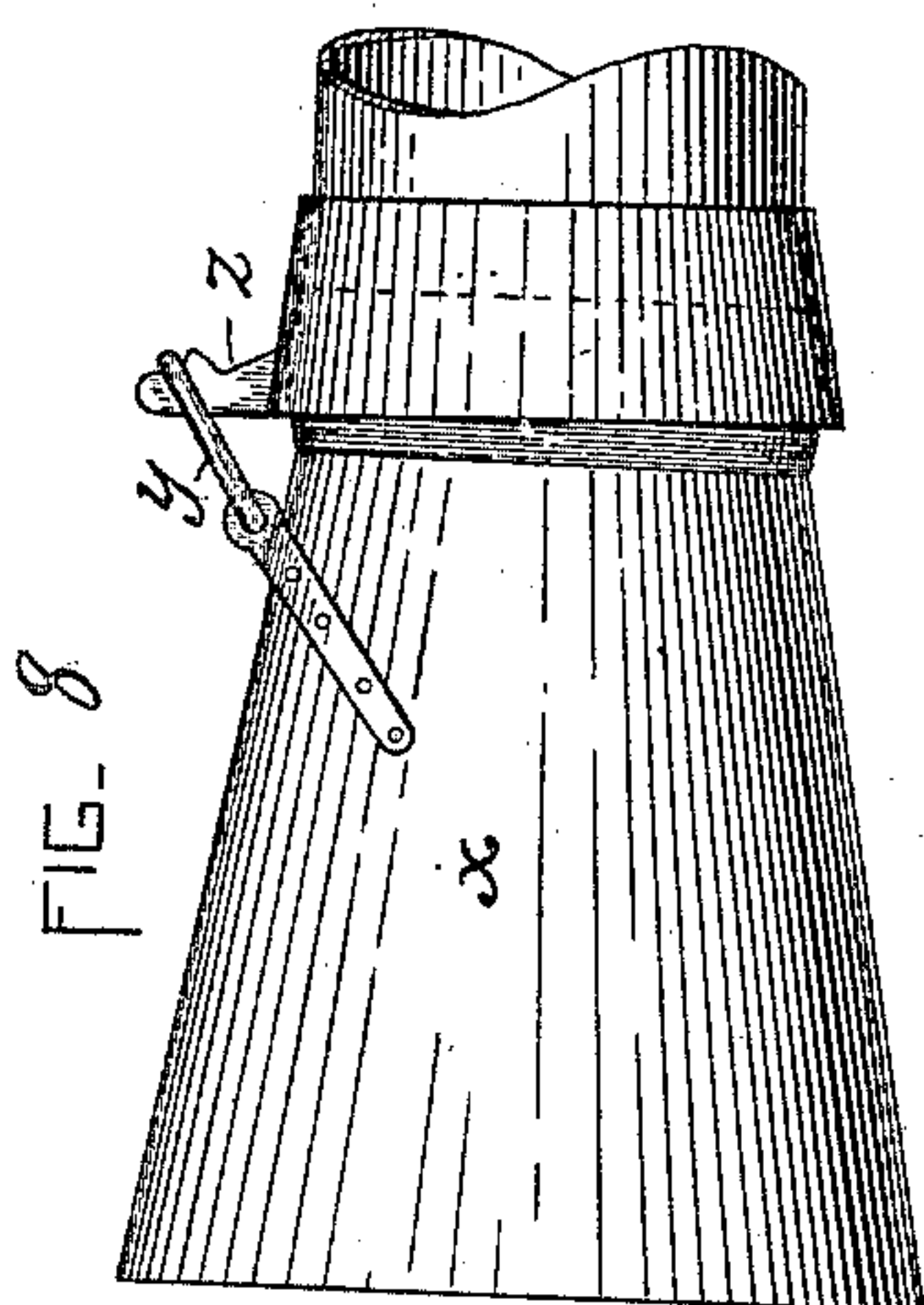


(No Model.)

3 Sheets—Sheet 1.

E. S. CRAM & G. S. ROBERTS.
SMOKE AND STEAM DISCHARGE FOR LOCOMOTIVES.
No. 427,673.
Patented May 13, 1890.



WITNESSES.
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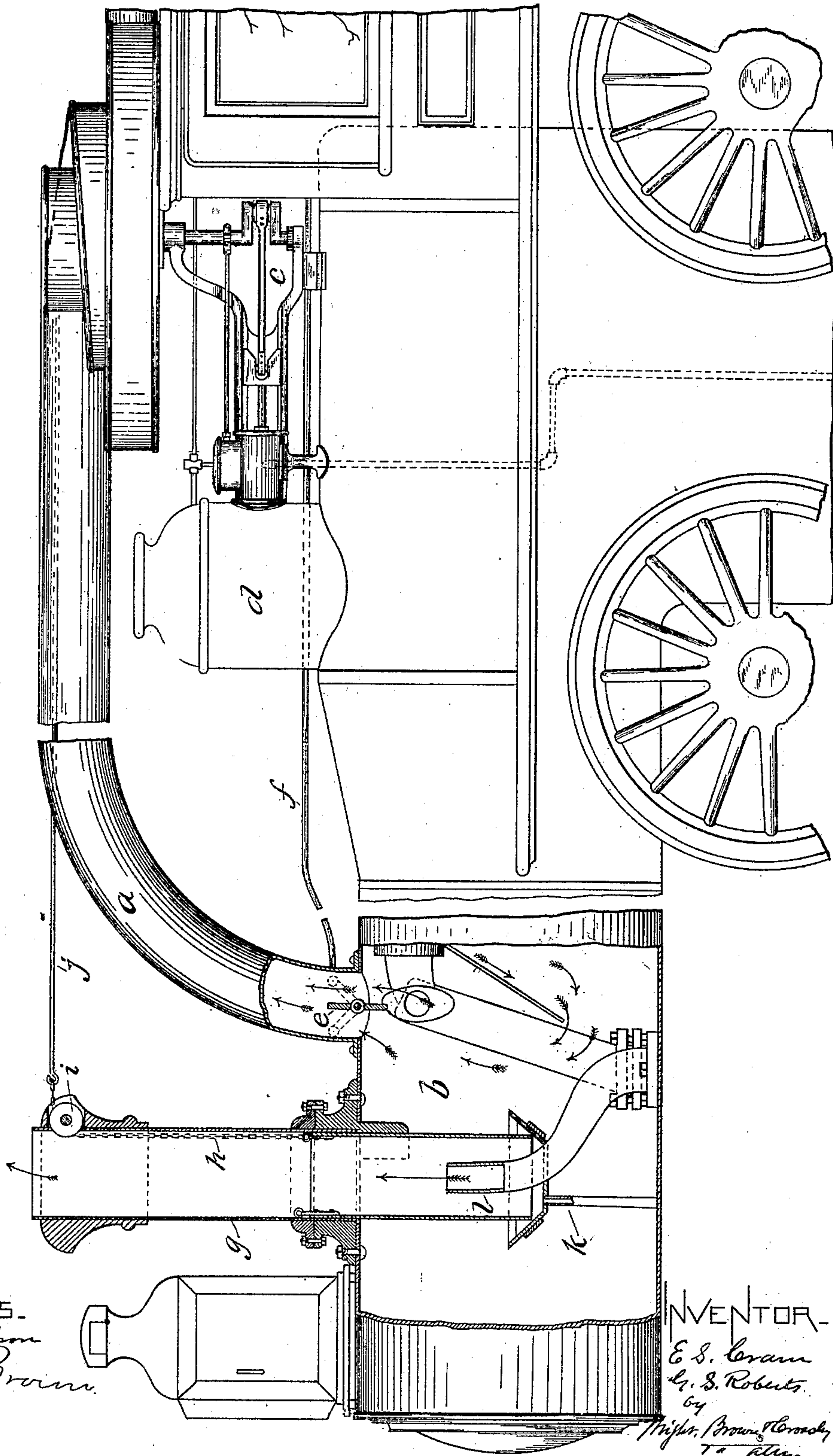
INVENTOR.
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(No Model.)

3 Sheets—Sheet 2.

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FIG. 2.



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3 Sheets—Sheet 3

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SMOKE AND STEAM DISCHARGE FOR LOCOMOTIVES.
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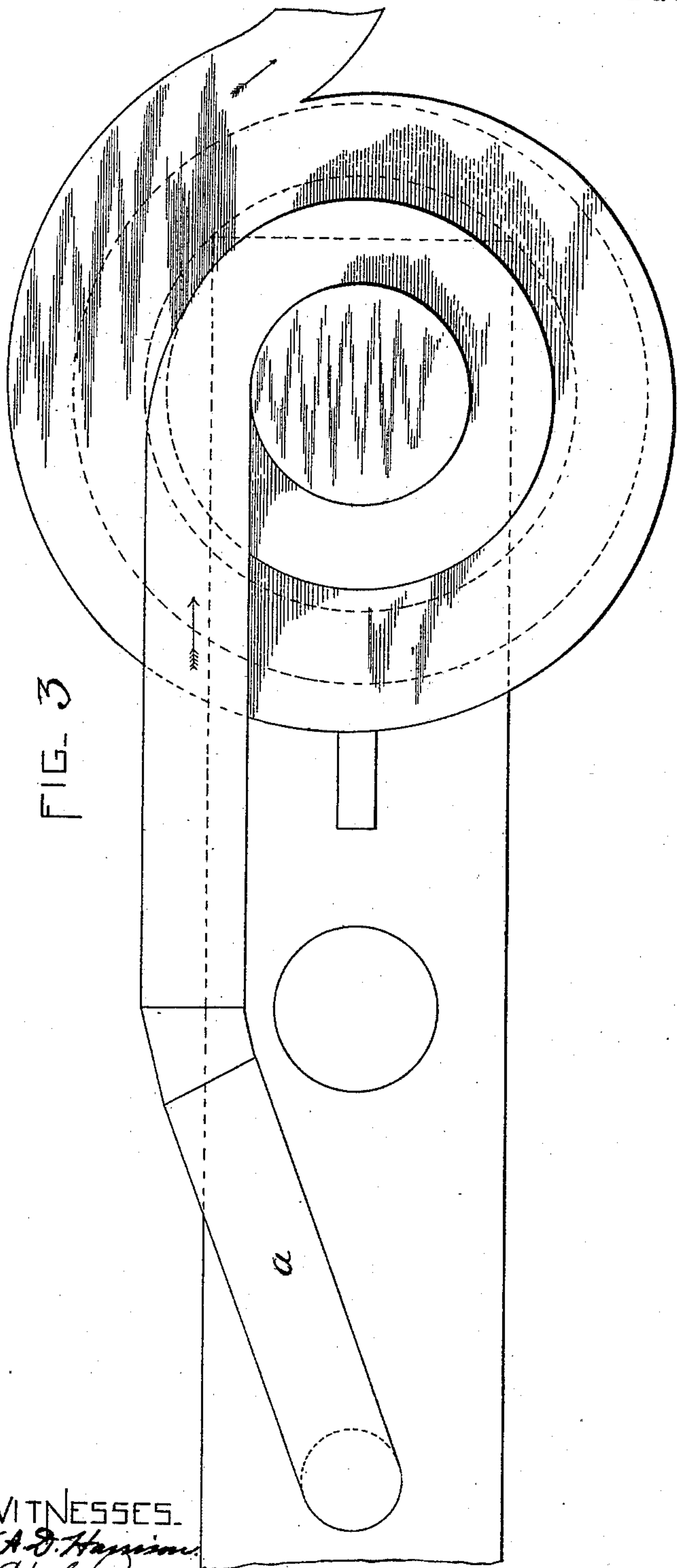


FIG. 3

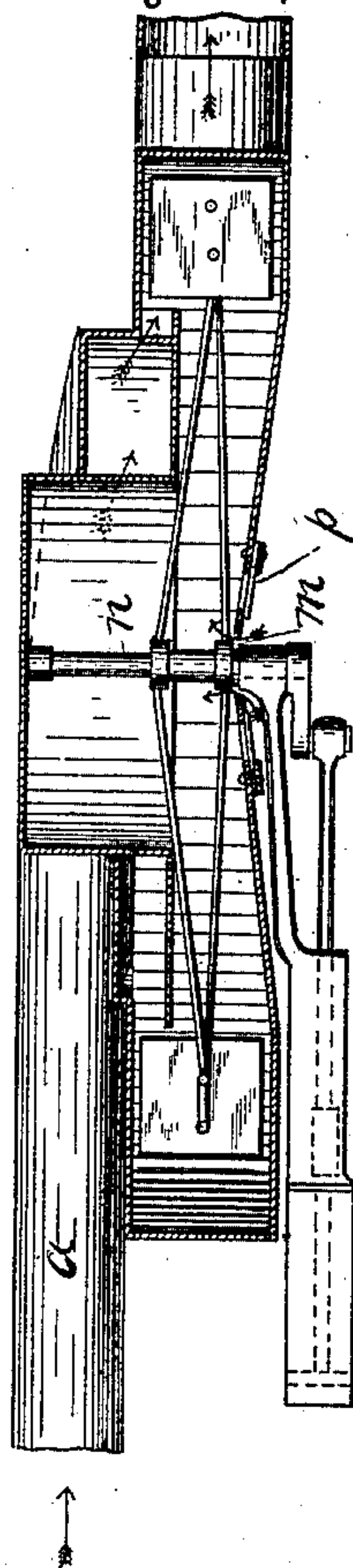


FIG. 4

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by *Wm. Brown & Co.,*
attys.

UNITED STATES PATENT OFFICE.

ELISHA S. CRAM AND GEORGE S. ROBERTS, OF MEREDITH, NEW HAMPSHIRE,
ASSIGNORS OF ONE-HALF TO CHARLES F. BROWN, OF READING, AND
ARTHUR W. CROSSLEY, OF BOSTON, MASSACHUSETTS.

SMOKE AND STEAM DISCHARGE FOR LOCOMOTIVES.

SPECIFICATION forming part of Letters Patent No. 427,673, dated May 13, 1890.

Application filed July 11, 1889. Serial No. 317,200. (No model.)

To all whom it may concern:

Be it known that we, ELISHA S. CRAM and GEORGE S. ROBERTS, of Meredith, in the county of Belknap and State of New Hampshire, have invented certain new and useful Improvements in Smoke and Steam Discharges for Locomotive-Engines, of which the following is a specification.

It is the object of our invention to provide such improvements in locomotive-engines as will render it practicable to conduct the products of combustion of the furnace to and discharge the same at the rear end of the train, and also to provide means for securing a steady draft on the fire in the furnace, and by having a larger exhaust-nozzle to obviate a portion by the back-pressure on the piston.

Heretofore it has been proposed to conduct both the exhaust-steam and the smoke and other products of combustion of the furnace from the engine through a pipe to the rear end of the train, and in most instances the force of the exhaust-steam and the draft from the furnace have been relied upon to secure the conduct and discharge of the steam, smoke, &c. This contrivance has been found impracticable from many causes, among which are the facts that the smoke soon becomes "dead" and the steam condenses to such an extent as to wet the cinders, &c., causing them to stick to the pipe and rendering their conveyance and discharge difficult, if not impossible.

Our invention consists in providing the locomotive with means whereby the separate or independent conditions of the steam from the engine and the products of combustion from the furnace may be maintained and the steam discharged through the stack, as heretofore, and the smoke, &c., conveyed through a pipe to the rear of the train, a blower or other suitable exhaust being in some instances employed in the accomplishment of the last-mentioned function.

Our invention also consists in combining with the foregoing means for so adjusting the necessary parts that the products of combustion from the furnace may be conveyed

through the stack with the exhaust-steam when necessary that the same should be done.

Reference is to be had to the annexed drawings, forming a part of this specification, the same letters designating the same parts or features, as the case may be, in all of the views.

Of the drawings, Figure 1 represents in outline a locomotive, tender, and car of a train equipped with our invention. Fig. 2 is a side view, partially in section, of so much of a locomotive as it is considered necessary to show in order to illustrate our invention. Fig. 3 is a top plan view of the blower employed to assist in the conduct and discharge of the smoke and other products of combustion from the furnace. Fig. 4 is a sectional view of the same. Fig. 5 is a side view of a form of coupling which may be employed to connect the sections of pipe between the cars. Fig. 6 is an end view of Fig. 5. Fig. 7 is a partially sectional view of a modified form of pipe-coupling device. Fig. 8 is a side elevation of a bell-mouth which may be attached to the rear end of the smoke-pipe, said view showing also a portion of the pipe to which the bell-mouth is coupled or attached.

In the drawings, *a* represents a pipe connected and communicating with the smoke-box *b*, which pipe extends rearwardly over the locomotive, its tender, and the cars or coaches connected therewith. At a convenient point over the locomotive the pipe *a* is provided with an exhaust or blowing device of suitable form and construction, which device may be operated by an engine *c*, receiving steam from the dome *d*, or other part of the locomotive. As here shown, the before-mentioned device consists of a blower, for the most part of common form, the function of which is to draw the products of combustion from the smoke-box through and discharge the same from the pipe *a* at the rear end thereof.

A valve *e* may be arranged in the pipe *a*, so as to cut off communication of the latter with the smoke-box, if it may be desired, or to partially close the communicating part between the smoke-box and pipe *a*. This valve

may be controlled by the engineer or fireman through the medium of a cord or rod *f* extending to the cab.

The smoke-stack *g* we construct in two parts, the upper part being fixedly arranged on the engine and the lower part constructed and arranged to "telescope" the upper part and so as to be movable longitudinally in the latter, the lower end of the movable part resting in a basin-like support, as is clearly shown in Fig. 1.

h designates a chain connected at its lower end with the upper end of the movable part of the stack and extending over a pulley *i* on the upper end of the stationary part, the other end of said chain being connected to a rod *j* reaching to the cab, so that the engineer or fireman drawing upon said rod may raise the lower movable portion of the stack off its support, and so open communication between the smoke-stack and smoke-box, or lower the said lower portion and so close such communication. A drip-pipe *k* is connected with the basin-like support of the lower portion of the stack to permit condensed steam settling therein to be drawn off therefrom.

The exhaust-nozzle *l* extends through the stack-support and into the stack, so that the steam may be exhausted into and through the latter, as usual.

By the means described we are enabled to maintain the separate condition of the steam and products of combustion of the furnace, discharging the former through the smoke-stack and the latter through the pipe *a* by aid of the blower, before referred to.

Openings *m* are provided in the lower portion of the casing of the blower, around the journal-shaft *n* of the latter, for the admission of external air, in order to keep said shaft cool and to assist the floats in keeping the hot air at the circumference of the blower. Valves *p* may be provided in the lower part of the blower for admission of an extra amount of cold air to the latter, if for any reason it should be desirable or necessary.

If it should become desirable or necessary to exhaust the smoke with the steam, as usual, the valve *e* may be closed and the lower movable part of the stack will be raised, when the steam and smoke may be exhausted together, as usual. It will be understood, of course, that other forms of means may be provided for opening and closing communication between the smoke-stack and pipe *a*, with a result the same as that which has been described.

The sections of the pipe *a* may be coupled at points between the cars by various means. One section or part may be constructed with a flaring mouth *q*, and the end of the other part, entering the flaring mouth, may be provided exteriorly with a band *r*, the surface of which may be given the form of the surface of a central section of a sphere, as shown in Fig. 7, so that the two parts may move to ac-

commodate themselves to the movements of the different cars and still preserve smoke-tight joints. Again, one part of the pipe may be made to telescope the other, as shown in full and dotted lines in Figs. 5 and 7, (both figures being considered together,) and so provide means whereby the pipes may accommodate themselves to the limited separation and the coming more closely together of the cars.

The two parts of the pipe may be coupled by various means. As shown in Figs. 5 and 6, a weighted crank-lever *s* may be pivoted to one part, as at *t*, the short arm of said lever acting against a flange *u* on the other part; or the weighted lever *s* may be made straight and provided with a hook *v*, arranged to catch over a lug or loop *w* on the other part, as shown in Fig. 7, or other suitable coupling means may be employed.

If desired, the rear end of the pipe *a* may be provided with a funnel or bell-shaped mouth *x*, as shown in Fig. 8, which funnel-mouth *x* may be coupled or connected with the pipe in any suitable way. As here shown, a loop or link *y*, pivoted on the bell-mouth piece *x*, is arranged to be caught over a lug or stud *z* on the adjacent part.

By our invention the steam, which is nearly, if not quite, without objection when discharged at the front of a train, may be exhausted as usual, while the objectionable smoke and cinders may be conducted to and discharged at the rear of the train conveniently and most efficiently.

The essential feature of our invention resides in maintaining the smoke and steam in separated condition and in conducting the former only to the rear of the train by means of an exhaust device.

Having thus explained the nature and a manner of constructing our invention and described a way of using the same, we declare that what we claim is—

1. A locomotive-engine provided with smoke and steam exhausts, the former being capable of conveying both the steam and smoke exhaust when the latter is closed, substantially as set forth.

2. A locomotive-engine provided with a steam-exhaust having a movable or sectional part, whereby it may convey both the steam and smoke exhaust, substantially as set forth.

3. A locomotive-engine provided with an independent outlet for the products of combustion from the furnace, and an independent steam-exhaust, and means for closing the independent smoke-exhaust and rendering the steam-exhaust common to both the smoke and steam, as set forth.

4. A locomotive-engine provided with a steam-exhaust having a movable or sectional part, the steam-exhaust pipe opening therein to, and the lower basin-like support, wherein said movable section or part is designed to rest, substantially as set forth.

5. A locomotive-engine provided with an independent steam-exhaust having a movable part, and the smoke-outlet pipe having a valve in its inner end, and a blower located in said
5 smoke-pipe which leads to the rear of the train, substantially as set forth.

In testimony whereof we have signed our names to this specification, in the presence of

two subscribing witnesses, this 10th day of May, A. D. 1889.

ELISHA S. CRAM.
GEORGE S. ROBERTS.

Witnesses:

J. I. PRESCOTT,
S. A. LADD.