

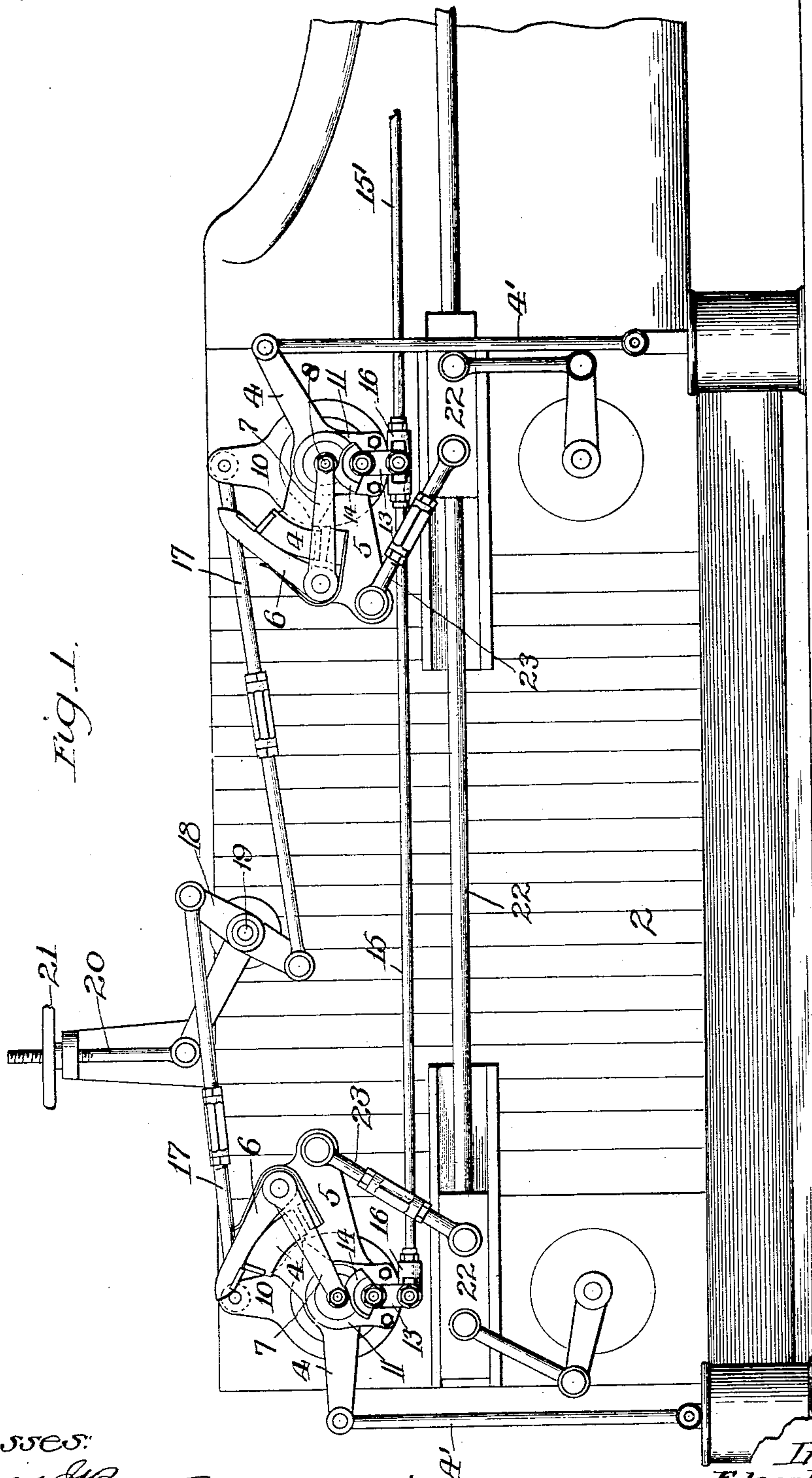
No. 733,157.

PATENTED JULY 7, 1903.

E. P. COLEMAN.
EXTENSION VALVE GEAR.
APPLICATION FILED JULY 5, 1902.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses:
Howard M. Barnett.
Lute S. Alter

Inventor
Edgar P. Coleman
By C. S. Hawley
Atty.

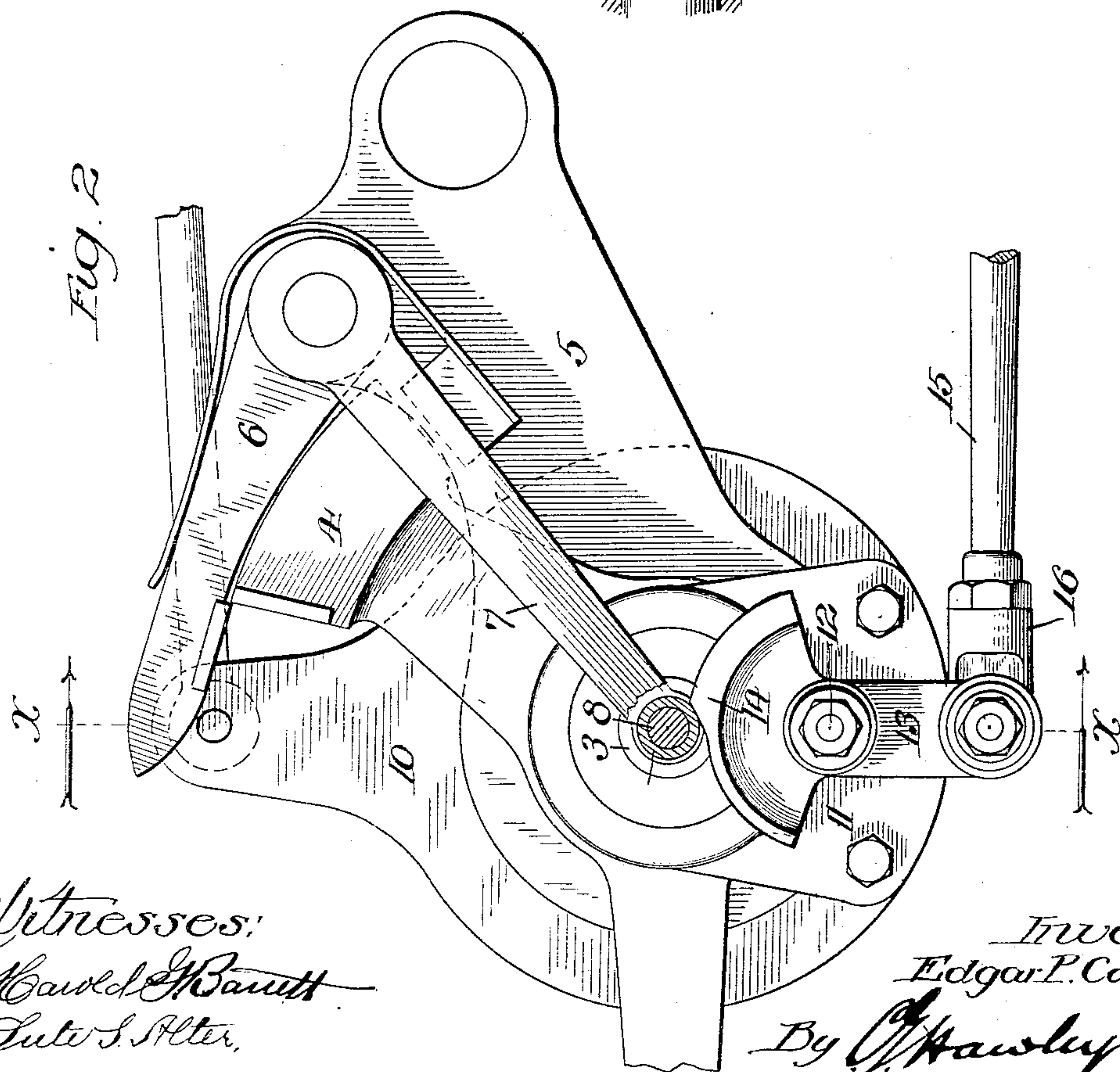
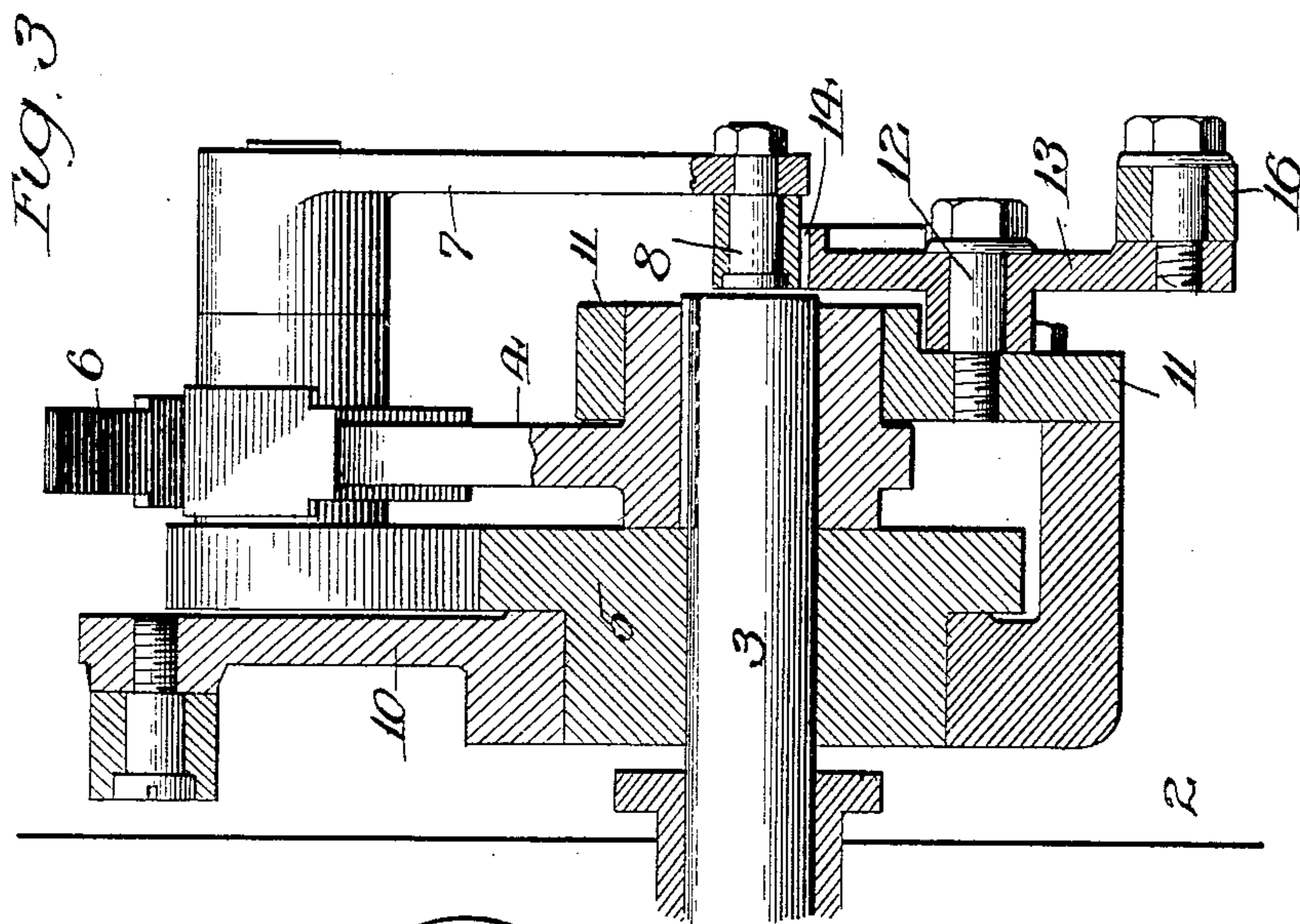
No. 733,157.

PATENTED JULY 7, 1903.

E. P. COLEMAN.
EXTENSION VALVE GEAR.
APPLICATION FILED JULY 5, 1902.

NO MODEL.

2 SHEETS—SHEET 2.



Witnesses:
Harold E. Bant
Lute S. Alter,

Inventor.
Edgar P. Coleman.
By C. Hawley Atty.

UNITED STATES PATENT OFFICE.

EDGAR P. COLEMAN, OF CHICAGO, ILLINOIS.

EXTENSION VALVE-GEAR.

SPECIFICATION forming part of Letters Patent No. 733,157, dated July 7, 1903.

Application filed July 5, 1902. Serial No. 114,404. (No model.)

To all whom it may concern:

Be it known that I, EDGAR P. COLEMAN, a citizen of the United States, residing at Chicago, Cook county, Illinois, have invented certain new and useful Improvements in Extension Valve-Gears, of which the following is a specification.

This invention relates to extension valve-gears for steam-engines, and has particular reference to extension-gears for Corliss engines.

There are many uses for steam-engines which may be described as "emergency" uses, the conditions being such that the engine is idle much of the time or, while normally carrying a small load, is occasionally required to drive an exceptionally heavy load. The practice has been in such cases to provide engines of a capacity equal to the largest load demands, which has entailed very large outlays in proportion to the sum total of work performed when compared with the cost of engines carrying a substantially unvarying load. The extended gear is especially useful on the low-pressure cylinders of compound engines, the long range of cut-off thus obtained enabling the operator to properly distribute the work between the high and low pressure cylinders at all times. This becomes doubly important with independent compound engines having separate independent crank-shafts for high and low pressure cylinders. Under the above conditions it has been found economical to employ engines having a valve motion that will enable the cut-off to be regulated from zero to maximum—that is, a valve-gearing that will supply the engine with steam throughout its full stroke when this is made necessary by a large load being thrown onto the engine. The Corliss engine being usually limited to a maximum cut-off of substantially forty-five per cent.—that is, less than half-piston stroke—though economical in steam consumption, does not adapt itself to emergency uses and its valve-gearing is of too limited range of cut-off for the low-pressure cylinders of compound engines. This has led to the use of the extension valve-gear for the Corliss engine, the object thereof being to retard the closing of the steam-valves and, if made necessary by the load, permit the engine to work under full

stroke of steam. My invention is of this class and is designed to overcome the objections to the extension valve-gears hitherto employed, all of which have been criticized for complexity and lack of precision in operation. I find that these objections arise because of the adherence by designers to the old type of steam-hook, the arm of which travels around the valve-axis at a considerable distance therefrom, such constructions entailing complicated arrangements of the knock-off cams and other parts.

The particular object of this invention is to provide an extension valve-gear for Corliss engines in which the knock-off cams shall travel in spaces determined by a suitable regulator and shall alone be relied upon for releasing the steam-latches from the valve-arms of the hook or trip levers, the valve-cranks being relieved from other than passive duty.

A further particular object of the invention is to greatly simplify the construction and lessen the cost of applying extension valve-gears to Corliss engines.

My invention consists, generally speaking, in an extension valve-gear comprising the usual valve-arm, steam-latch, valve-crank lever, and knock-off cam-lever in combination with a trip-lever, the free end of which is substantially concentric with the axis of the valve, a knock-off cam pivoted at a point remote from the valve-axes, means for swinging the pivot-point about the valve-axis to change the stroke position of the knock-off cam, and means for regularly swinging or operating said knock-off cam to operate the latch and free the valve-arm and valve.

My invention also consists in various constructions and in combination of parts, all as hereinafter described, and particularly pointed out in the claims.

My invention will be more readily understood by reference to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 illustrates an extension valve-gear embodying my invention. Fig. 2 is an enlarged view of the valve-gear for one valve, and Fig. 3 is a sectional view thereof on the line *x x* of Fig. 2.

In the drawings I have illustrated the in-

vention as applied to a Corliss engine of the ordinary horizontal type, but my invention is applicable to other types as well. The cylinder 2 has the usual inlet or steam valves and exhaust-valves, and 22 represents a suitable valve-operating slide or part that is worked from an eccentric on the engine crank-shaft. The exhaust-valves need not be described, the invention being shown in connection with the inlet or live-steam valves. The valve-gears are identical for the two valves except as to positions, which are reversed, and the invention will be better understood by considering a single valve. The double valve-arm 4, the dash-pot, the rod 4', the steam-latch 6, the valve-crank 5, the reach-rod 23 therefor, and the knock-off cam-lever 10 are of the ordinary design. The valve-arm 4 is fixed upon the valve-stem 3, (see Fig. 3,) while the latch 6 is pivoted upon the lever 5, which is journaled upon the valve-stem 3. The lever 5 is provided with a boss, on which the knock-off cam-lever 10 is journaled. The latch 6 is spring-pressed, as usual, but differs from like parts of other engines in having a longer trip-lever 7, which instead of approaching a stationary knock-off toe at a tangent thereto occupies a radial position, with its free end 8 substantially concentric with the valve-stem, this being the position when the latch is still engaged with the valve-arm 4. The lever 5 is worked regularly by the slide 22, and the latch engages the valve-arm and is released therefrom during the respective strokes of the slide on the engine-piston, the slide operating substantially ninety degrees plus lead in advance of the piston. The knock-off cam-lever 10 is provided with an outboard bearing 11, which, extending inwardly, encircles a boss on the valve-arm 4, that serves as a journal therefor. On this outboard bearing is a stud 12, upon which the knock-off cam-arm 13 is journaled, said arm having a cam-surface 14, adapted to engage and operate the free end of the trip-lever, and thus throw out the latch to release the valve-arm 4. The knock-off cam-lever 10 remains stationary during the operation of the engine under constant load, but is moved when the load of the engine changes.

Referring now to Fig. 1 of the drawings, it will be seen that the two knock-off cam-levers 10 are connected by the rod 17 and the T 18, which is journaled on the fixed stud 19. The T 18 is adjustable by means of the screw-spindle 20 and the hand-wheel 21, or in place of this hand-regulating means the T may be connected directly to the engine-governor. In most instances where the use is of an emergency character or when the extension-gear is used on the low-pressure side of a compound engine it is preferred to regulate the engine by hand. The knock-off cam-arms 13 are connected by the rod 15 or like means which fixes the distance between the knock-off cam-arms. This rod is operated in proper

phase relation to the slide-rod 22 and connected parts. The knock-off cam-arms 13 being on the levers 10 at points remote from the valve-centers and having their free ends held by the rod 15, it will be evident that when the levers 10 are moved by means of the regulator the positions of the pivots or studs 12 will be changed with relation to the pivot connections with the rod 15, with the result that the position of the stroke-space of the knock-off cams will be altered to cause the same to either increase or decrease the play of the cam-surfaces toward and from the trip-levers 7, according to the elevation or depression of the regulating-screw 20. The result of the regulating movement of the knock-off cam-levers 10 is to hasten the time in which each knock-off cam engages its trip-lever or retard the same, in accordance with which the release of the valve-arm will be hastened or retarded to decrease or increase the period of steam admission to the cylinder. The stroke of the knock-off cams may be so far retarded with relation to the trip-levers that steam will be admitted during substantially the entire stroke of the engine-piston, the knock-off movement occurring during the closing movement of the valve-arm 4 at each valve, an operation that is impossible with the ordinary Corliss valve-gear.

The advantages of my extension valve-gear are simplicity of construction, firmness of bearing for the knock-off cams, and precision of operation of the knock-off cams and steam-hooks, and the ease with which the single eccentric Corliss gear may be converted into an engine with extended releasing-gear. It is obvious that the hand or governor regulator may be connected between the knock-off cams and the regular movement imparted to the knock-off cam-levers 10 and generally that various modifications of my invention will readily suggest themselves to one skilled in the art, and I therefore do not confine my invention to the specific construction herein shown and described.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. An extension valve-gear comprising the usual valve-arm, latch, valve-crank and knock-off cam-lever in combination with a trip-lever the free end of which is substantially concentric with the axis of the valve, a knock-off cam pivoted at a point remote from the valve-axis, means for swinging the pivot-point about the valve-axis to change the stroke position of the knock-off cam and means for regularly swinging or operating said knock-off cam to operate the latch and release the valve-arm and valve, substantially as described.

2. The extension valve-gear comprising the ordinary Corliss valve-gear in combination with radial trip-levers, knock-off cams pivoted at points remote from respective valve-axes, means for operating said cams and

means for swinging the pivots of said cams about their respective valve-axes, substantially as described.

3. The extension valve-gear comprising the valve-arms, latches and valve-cranks of the two valves and means for operating the same, in combination with the trip-levers, knock-off cam-levers suitably connected and the regularly-moving knock-off cams arranged on said knock-off cam-levers, substantially as described.

4. The extension valve-gear comprising the valve-arms, latches and valve-cranks of the two valves and means for operating the same, in combination with the trip-levers, knock-off cam-levers suitably connected and the regularly-moving knock-off cams pivoted on said knock-off cam-levers and adjustable thereby and operating means connecting the knock-off cams of the two valves, substantially as described.

5. In an extension valve-gear for Corliss engine, the combination of the valve-arms, latches and valve-cranks with the trip-levers having their free ends substantially concentric with the valve-centers, the knock-off cam-levers, a regulator or governor connection between said knock-off cam-levers, the knock-off cams pivoted upon said levers and means connecting said knock-off cams for operating the same in proper time with the valve-cranks, substantially as described.

6. In an extension valve-gear for a Corliss engine, the combination, of the steam-valves, the valve-arms thereof, the latches, the valve-cranks and operating means, with the trip-levers, the knock-off cam-levers, means for adjusting said knock-off cam-levers, the knock-off cam-arms pivoted on said knock-off cam-levers and having cam-surfaces to engage respective trip-levers, means connecting the knock-off cam-arms and means for regularly operating said cam-arms and cams, substantially as described.

7. In an extension valve-gear, the combination of the valve-arms, latches and valve-cranks regularly operated, with the trip-levers, the knock-off cam-levers situated behind the valve-arms and having the outboard bearings described, the knock-off cams pivoted on said outboard bearings to engage said trip-levers, means for operating said knock-off cams regularly and means for adjusting said knock-off cam-levers, substantially as described.

8. In an extension valve-gear for Corliss engine, the combination of the valve-arms, of the valves, with the latches and valve-cranks therefor, the valve-crank-operating means,

the trip-levers 7 having their free ends substantially concentric with the valve-centers, the knock-off cam-levers 10 concentric with the valve-centers, the outboard bearings thereof, the knock-off cam-arms 13 pivoted on said bearings and having cam-surfaces 14 to engage said trip-levers 7, rigid means connecting said knock-off cam-arms, means for operating the same and the regulator connection between the said levers 10, substantially as described.

9. The extension valve-gear comprising the usual Corliss valve-gear, in combination with radial trip-levers for the latches of said gear, knock-off devices pivoted at points remote from respective valve-axes, means for shifting the pivot-points of said devices and regular operating means for actuating said devices to meet said trip-levers, substantially as described.

10. The extension valve-gear comprising the usual Corliss valve-gear, in combination with radial trip-levers for the latches of said Corliss gear, knock-off cam-levers, knock-off devices carried thereby and adjustable therewith about the valve and means for operating said levers and said devices, substantially as described.

11. The extension valve-gear comprising the usual valve-arms, latches, valve-cranks and operating means, in combination with the trip-levers for said latches, the free ends of said trip-levers being, normally, substantially concentric with the axes of said valve, the knock-off cam-levers suitably pivoted concentrically with said valves, means for adjusting the same, the knock-off devices arranged upon said cam-levers and adjustable thereby and means for regularly operating said devices, substantially as described.

12. An extension valve-gear comprising the usual valve-arms, latches and means for operating the same, in combination with the radially-disposed trip-levers of said latches, the knock-off cam-levers pivoted concentrically with respect to the valves, means for adjusting said levers simultaneously, the outboard bearings upon said knock-off cam-levers, the knock-off devices arranged thereon and the regularly operative means for actuating said devices, substantially as described.

In testimony whereof I have hereunto set my hand, in the presence of two witnesses, this 14th day of June, 1902.

EDGAR P. COLEMAN.

In presence of—

C. G. HAWLEY,

J. W. BECKSTROM.