G. C. VOLLMER.

AIR COMPRESSOR.

APPLICATION FILED JUNE 5, 1909.

966,494.

Patented Aug. 9, 1910.

4 SHEETS—SHEET 1.

Fig. 1

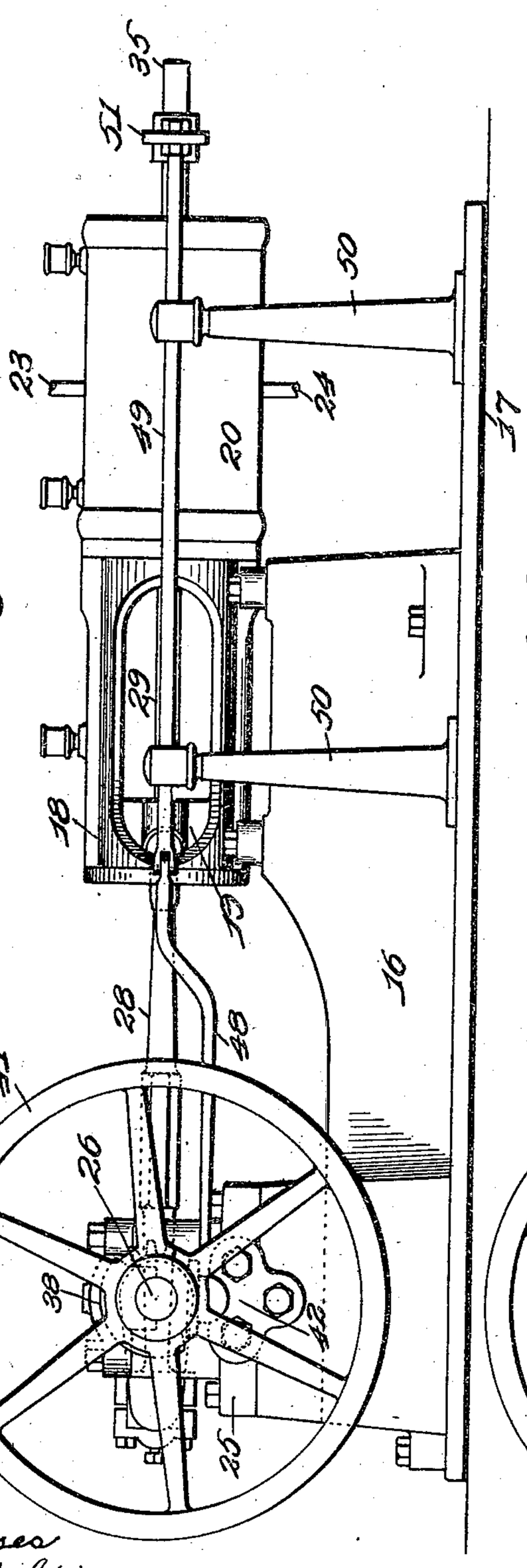
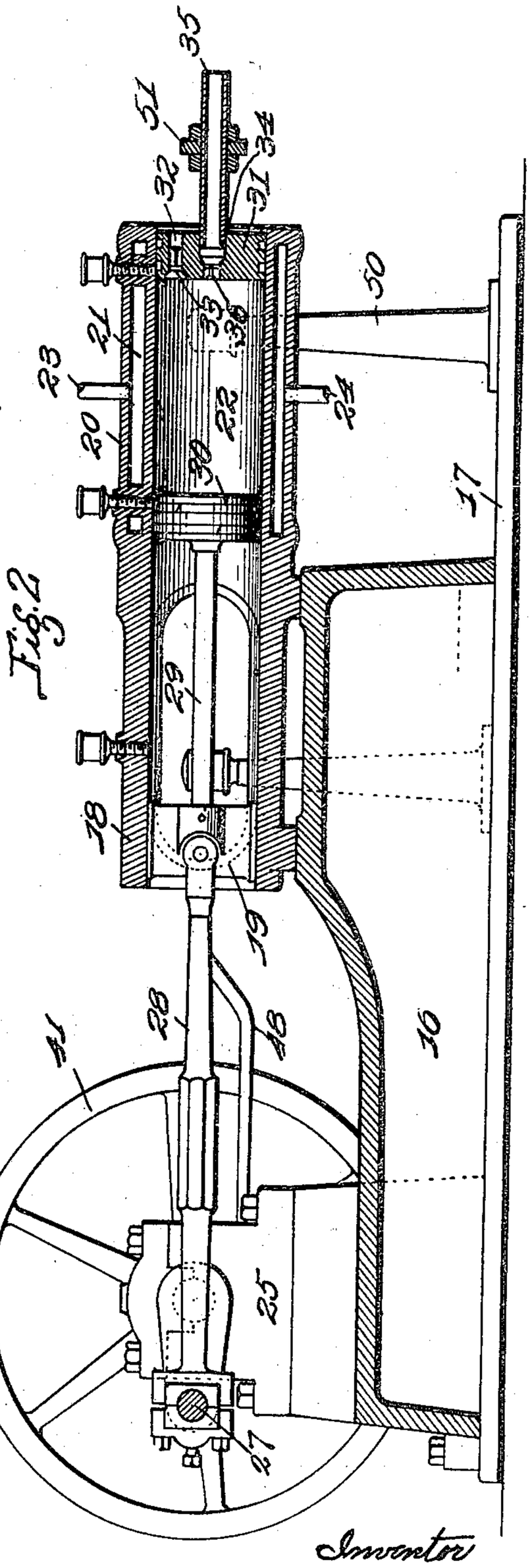



Fig. 2




Witnesses

H. B. Stein

L. A. L. McIntyre

Inventor

Gustav C. Vollmer

By Hopkins & Eicks, Attys

G. C. VOLLMER.

AIR COMPRESSOR.

APPLICATION FILED JUNE 5, 1909.

966,494.

Patented Aug. 9, 1910.

4 SHEETS—SHEET 2.

Fig. 3.

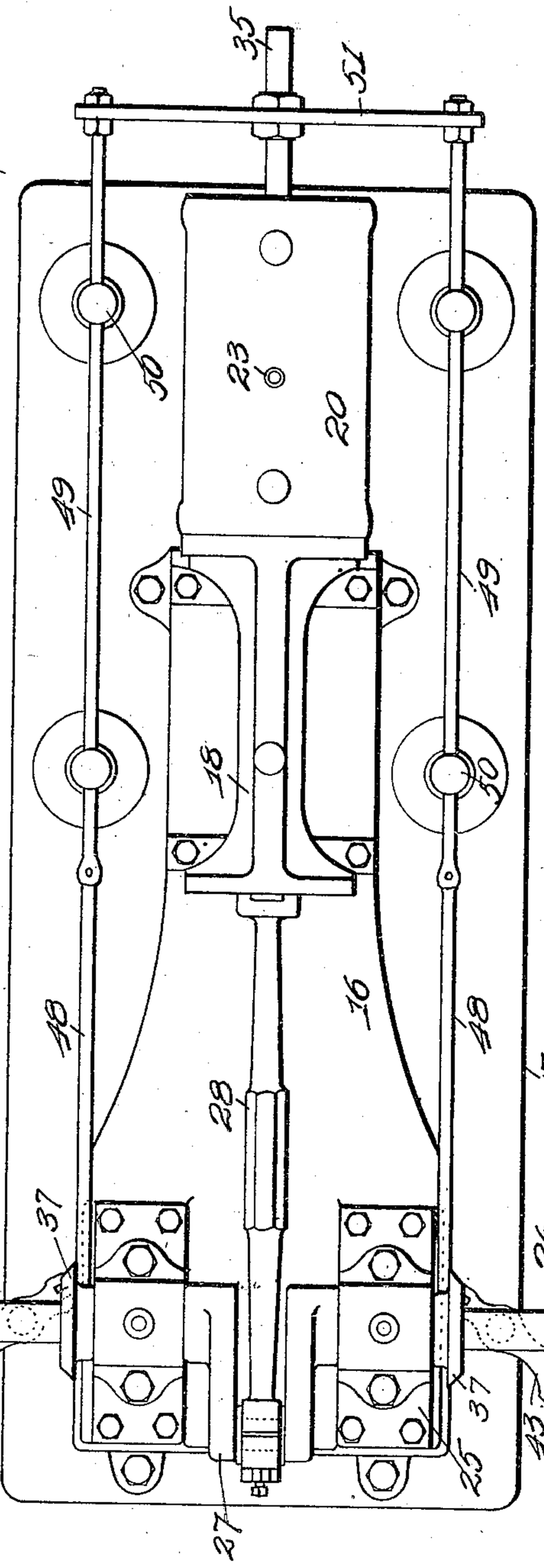



Fig. 9.

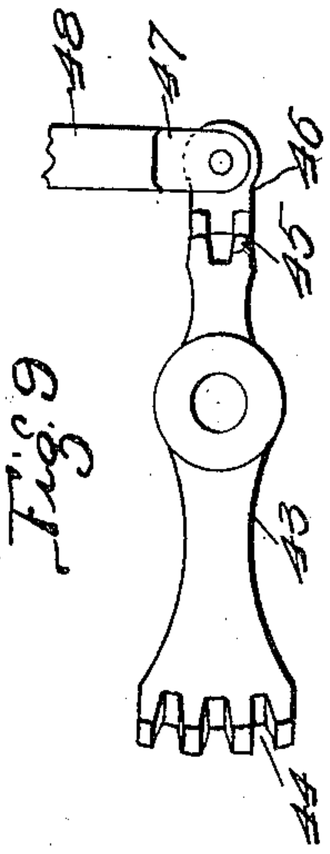



Fig. 7

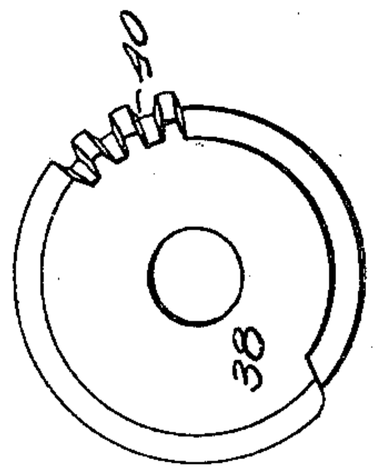
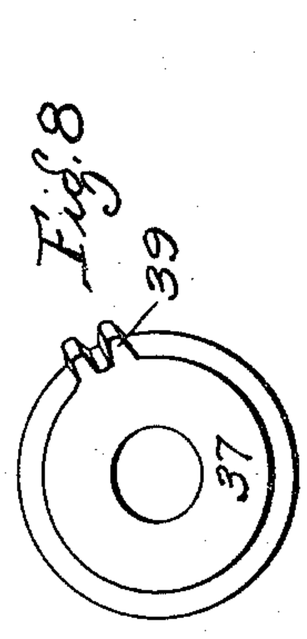



Fig. 8




Witnesses
W. B. Stein
L. A. L. McIntyre

Inventor
Gustav C. Vollmer
by Hopkins & Dicks. Attys

G. C. VOLLMER.

AIR COMPRESSOR.

APPLICATION FILED JUNE 5, 1909.

966,494.

Patented Aug. 9, 1910.

4 SHEETS—SHEET 3.

Fig. 4.

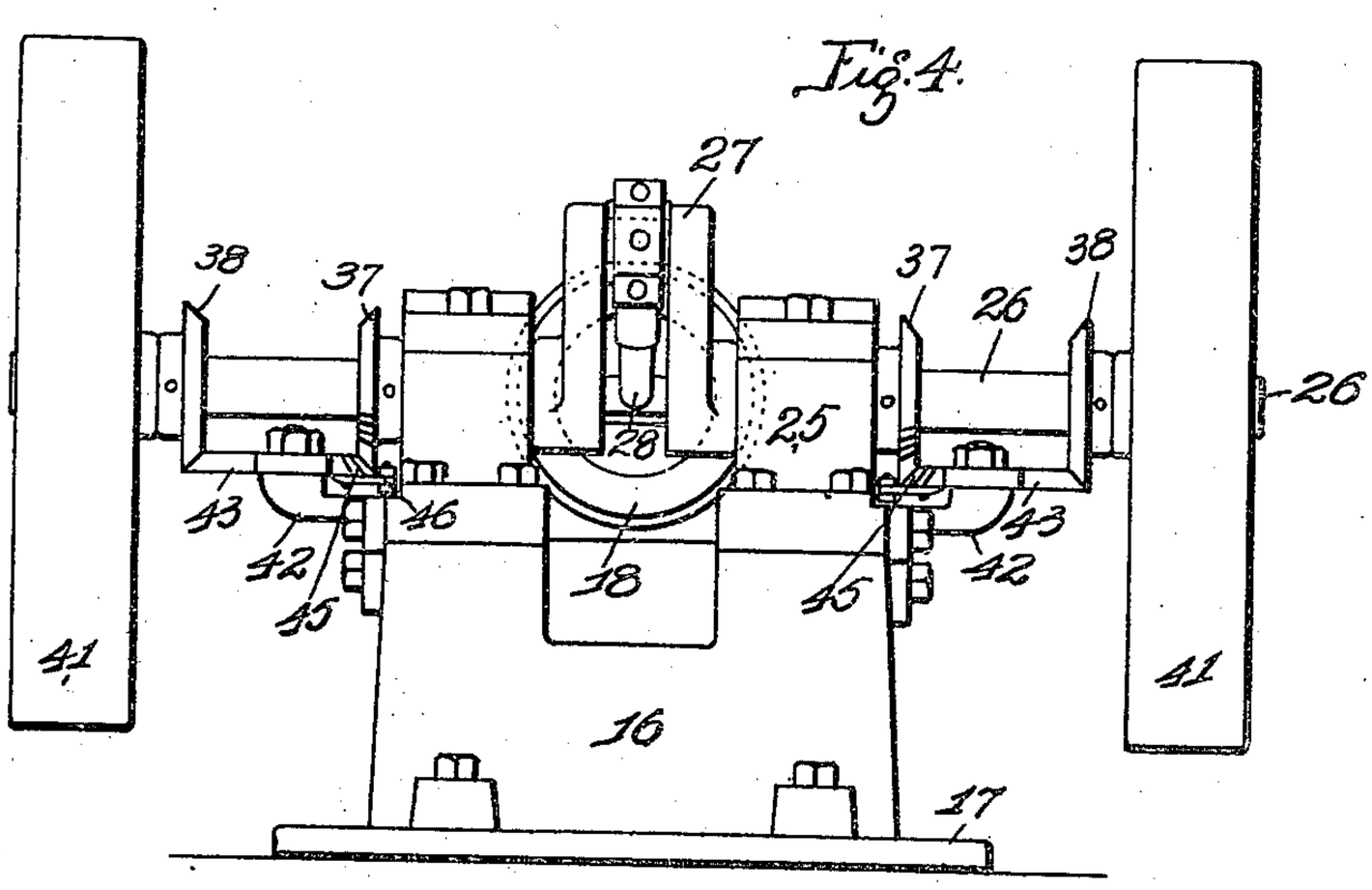



Fig. 5.

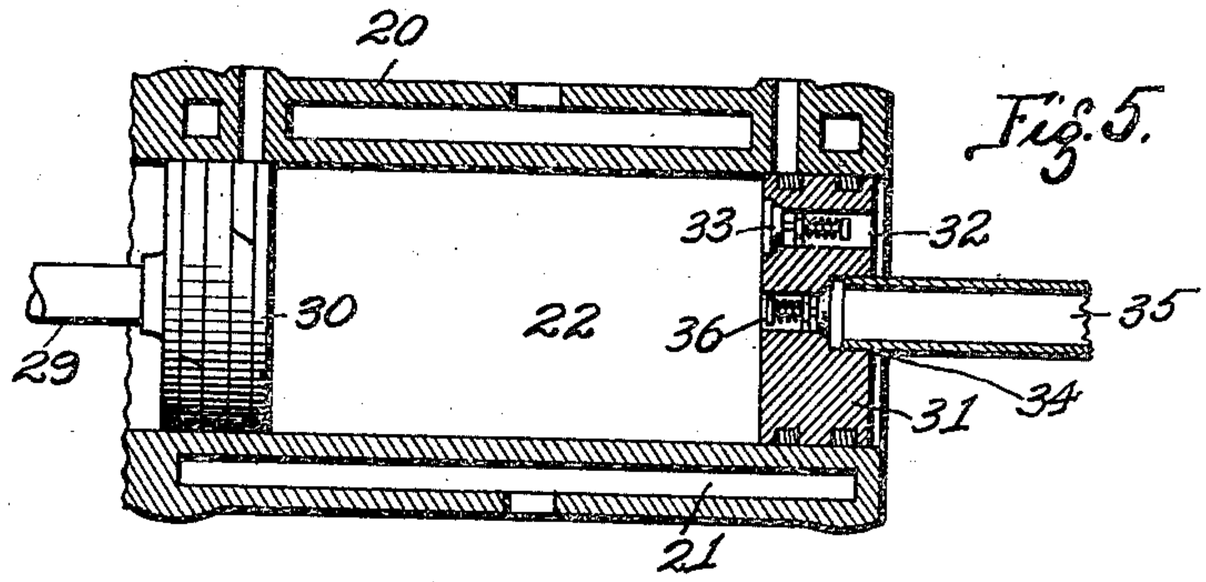
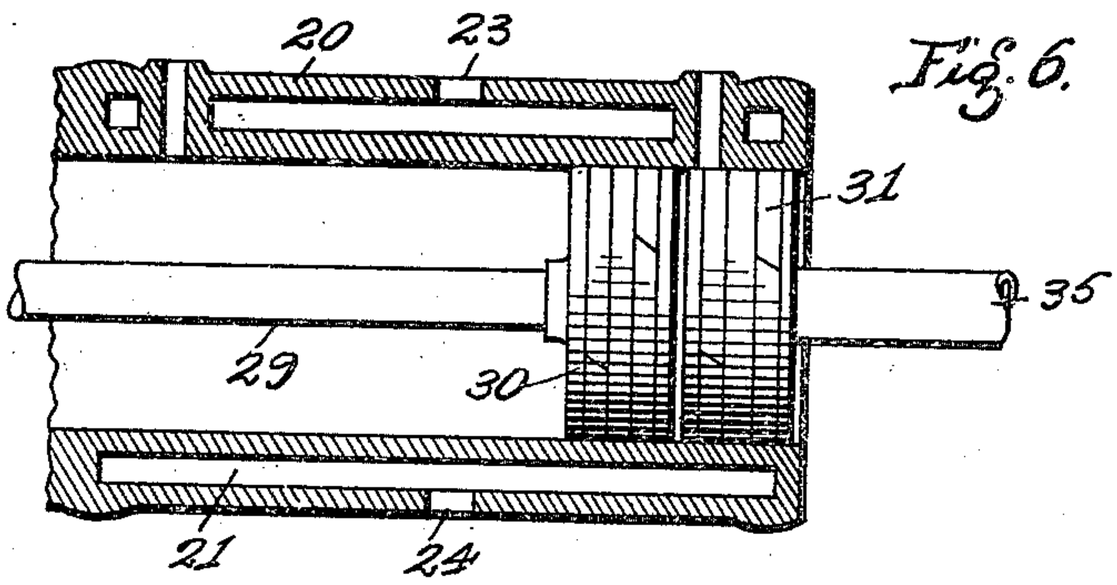



Fig. 6.




Witnesses
W. B. Stein
L. A. L. McIntyre

Inventor
Gustav C. Vollmer
by Hopkins & Eicks Attys

G. C. VOLLMER.

AIR COMPRESSOR.

APPLICATION FILED JUNE 5, 1909.

966.494.

Patented Aug. 9, 1910.

4 SHEETS—SHEET 4.

Fig. 10.

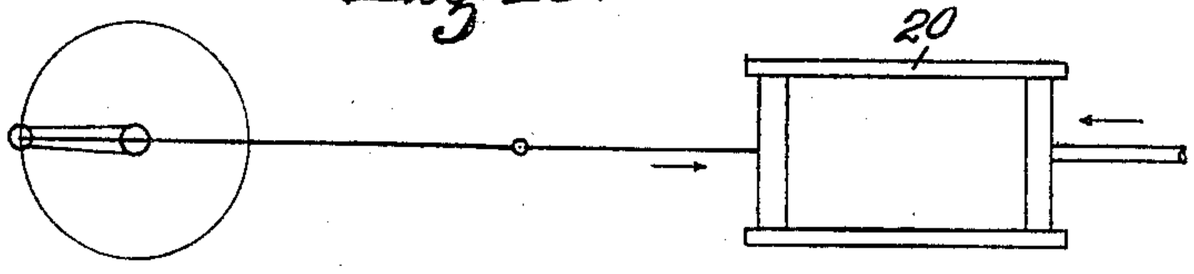



Fig. 11.

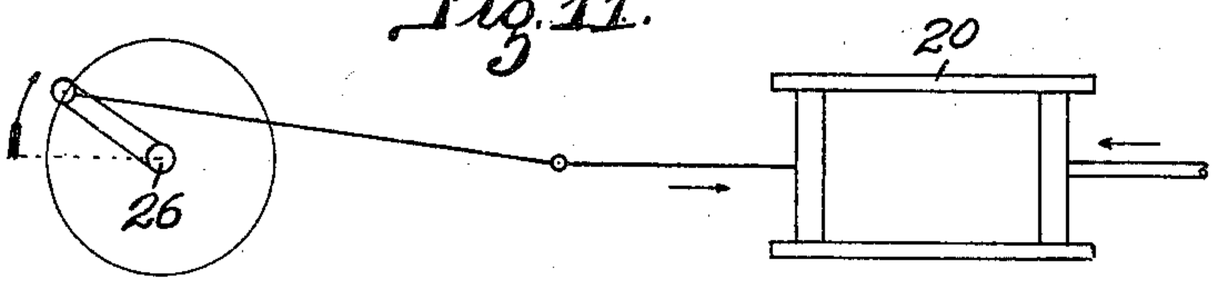



Fig. 12.

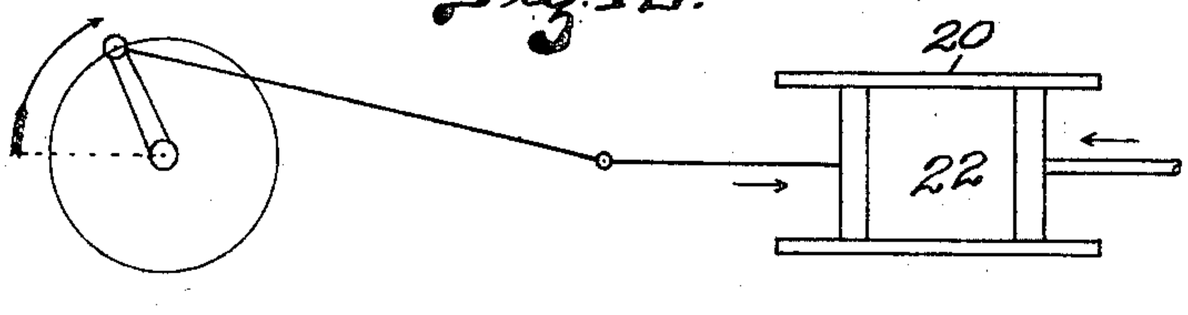



Fig. 13.

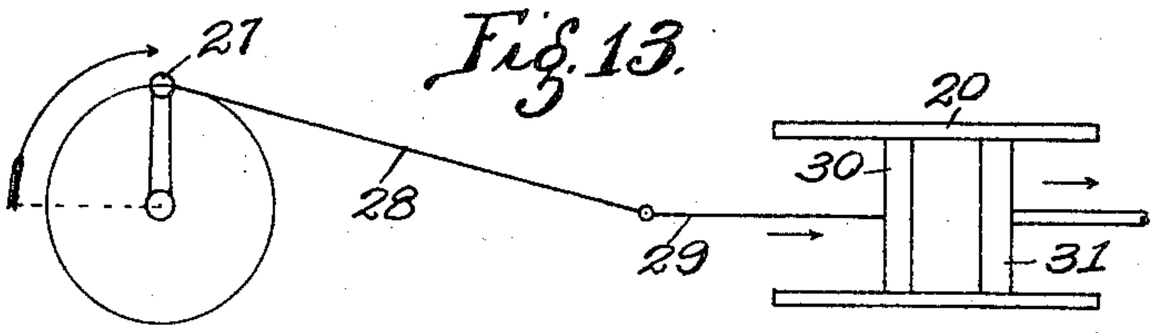



Fig. 14.

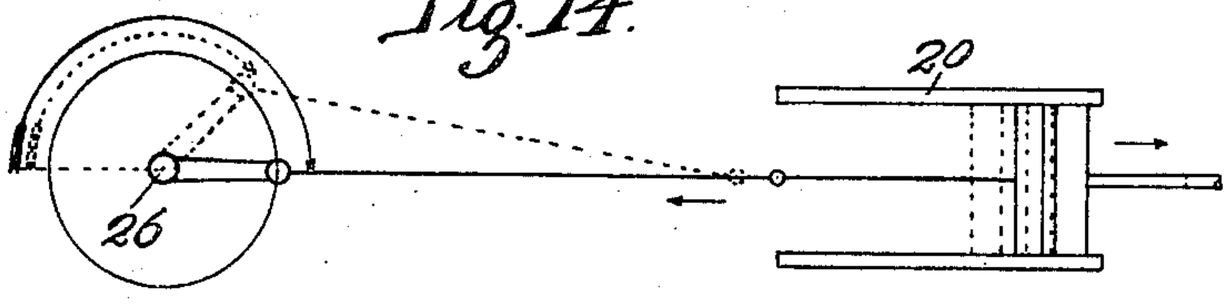
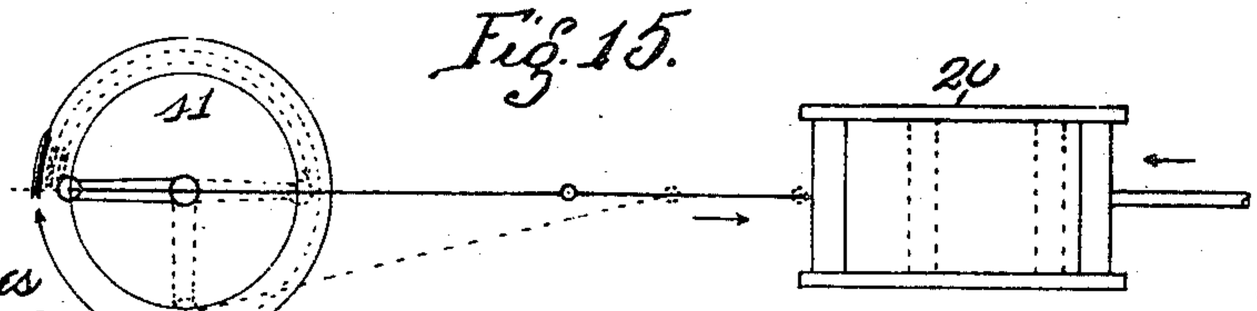



Fig. 15.




Witnesses
W. C. Stein
L. A. L. McIntyre

Inventor.
Gustav C. Vollmer
by Hopkins & Eicks. Attys.

# UNITED STATES PATENT OFFICE.

GUSTAV C. VOLLMER, OF ST. LOUIS, MISSOURI.

## AIR-COMPRESSOR.

966,494. Specification of Letters Patent. Patented Aug. 9, 1910.

Application filed June 5, 1909. Serial No. 500,309.

*To all whom it may concern:*

Be it known that I, GUSTAV C. VOLLMER, a citizen of the United States, and resident of St. Louis, Missouri, have invented certain new and useful Improvements in Air-Compressors, of which the following is a specification.

This invention relates to improvements in air compressors and has for its object to provide a compression chamber in which a compression piston and a reciprocating cylinder head operate.

A further object of my invention is to provide a compressor having a compression chamber in which is located a reciprocating cylinder head which operates in conjunction with a compression piston, whereby air is compressed within the compression chamber between the piston and reciprocating cylinder head, at the same time relieving a greater portion of the resistance caused in air compression.

In the drawings—Figure 1 is a side elevation of my complete compressor. Fig. 2 is a central vertical sectional view of the same. Fig. 3 is a top plan view. Fig. 4 is an end view of the same. Figs. 5 and 6 are sectional views of the cylinder in which operate the pistons and reciprocating cylinder head, showing the same in various positions. Fig. 7 is a detail view of one of the mutilated gears made use of in connection with my invention. Fig. 8 is a detail view of the second mutilated gear made use of in my invention. Fig. 9 is a top plan view of one of the gear levers or the like with which engages the mutilated gears for operating the reciprocating cylinder head. Figs. 10, 11, 12, 13, 14 and 15 are diagrammatic views showing the piston and reciprocating cylinder head in their various positions during the operation of the compressor.

In the construction of my invention I provide a suitable compressor frame 16 mounted upon a base-plate 17. On the frame 16 is mounted a cross-head guide-frame 18 in which is guided and operated the cross-head 19. On the outer end of the cross-head guide-frame is rigidly attached a cylinder 20 which is properly water-jacketed as indicated by the numeral 21, and in said cylinder is located the compression chamber 22. The water-jacket 21 is provided with a water inlet 23 and an outlet 24 so as to provide proper circulation to thoroughly cool the compression chamber.

On the frame 16 and located at the opposite end thereof are journal bearings 25 in which is mounted a driving shaft 26, the said shaft provided with a crank 27 located between the journal bearings and to said crank is attached the connecting rod 28, the opposite end of said rod being attached in the usual manner to the cross-head 19.

The cross-head 19 is provided with a piston rod 29 on the end of which is rigidly mounted the piston head 30 which operates in the compression chamber 22. In said compression chamber is also located a reciprocating cylinder head 31 which is provided with an inlet 32 and in said inlet is located an inlet valve 33 which is designed to admit the air from the atmosphere to pass into the compression chamber 22 during the rearward movement of the piston head 30. In said reciprocating cylinder head is also located a central opening 34 in which is inserted a pipe 35 and in said opening is located a valve 36 so arranged as to admit the compressed air in the chamber under pressure to pass out through the pipe 35 into a suitable reservoir. The end of the pipe 35 is connected to the reservoir by any suitable flexible connection so arranged as not to interfere with the reciprocatory movement of the cylinder head.

On the shaft 26 are located mutilated gears 37 and 38, the gears 37 being placed upon the shaft next to the journal bearings and each provided with two gear teeth 39; the gears 38 being located upon said shaft a reasonable distance from the gear 37 and said gears are each provided with three gear teeth 40. On said shaft are also mounted pulleys 41 by which the compressor is placed in operation by connecting the same either to an engine or motor.

On the frame 16 are securely fastened brackets 42 and on said brackets are pivotally mounted gear levers or the like 43, one end provided with a series of gear teeth 44, the opposite end having a pair of gear teeth 45 and a projecting lug 46 to which is pivotally attached the end 47 of the connecting rods 48, the opposite ends of said rods hingedly connected to one end of the guide rods 49, which are located on each side of the compressor and are supported in the standards 50. The opposite ends of the guide rods 49 are connected to a cross-bar 51 which is adjustably secured to the pipe 35 and by means of this connection and by the

operation of the drive shaft the reciprocating cylinder head is operated in conjunction with the piston.

The gear levers are located directly beneath the driving shaft, the teeth 45 arranged to engage with the teeth 39 on the mutilated gear 37 while the teeth 44 are arranged to engage with the teeth 40 of the mutilated gear 38. The mutilated gears are so set upon the driving shaft 26 as to alternately contact with the gear levers providing oscillatory movement to the same and by this arrangement the reciprocating cylinder head is placed in operation at a given period at a speed slower than the piston.

The various positions of the piston and reciprocating cylinder head are shown in Figs. 10, 11, 12, 13, 14 and 15. Fig. 10 shows the piston and the reciprocating cylinder head at its outermost position. Fig. 11 shows the crank shaft partially raised and the piston partially compressing. At this juncture the teeth of the mutilated gears 37 are in contact with the teeth 45 of the gear levers pulling upon the guide rods and causing the reciprocating cylinder head to move inwardly toward the piston. Fig. 12 shows the crank shaft almost at a quarter turn and the reciprocating cylinder head at its limit of inward movement. Fig. 13 shows the crank shaft at a quarter turn. At this period the teeth 40 of the mutilated gear 38 are contacting with the teeth 44 of the gear lever, causing the operation of same together with the guide rods in an opposite position, thereby causing reciprocating cylinder head to move outwardly in the same direction with the piston. Fig. 14 shows the crank shaft at a half turn, with its piston at its limit of movement and the reciprocating cylinder head at its limit of outward movement, the air between the same in the cylinder having been compressed and forced outwardly through the valve 36 into the pipe 35 and delivered to the reservoir. At this point the crank shaft moves from its half turn to its outward limit as shown in Fig. 15 and while in this operation the piston, during its travel, creates a suction and permits the air from the atmosphere to pass through the inlet 32 and fill the chamber 22. During this operation the reciprocating cylinder head is undisturbed.

The arrangement of the gear levers is such as to operate the reciprocating cylinder head somewhat slower than the operation of the piston and in this manner during the compression and while in the position as shown in Figs. 12, 13 and 14, air is being compressed between the piston and reciprocating cylinder head.

Having thus fully described my invention, what I claim as new and desire to have secured to me by the grant of Letters Patent, is:

1. An air compressor comprising a cylinder; a driving shaft; a piston; a reciprocating cylinder head; an intake and a discharge valve located in said cylinder head; a pair of guide rods connected to the head and operating on each side of the cylinder; a pair of connecting rods communicating with the guide rods; gear levers operating in conjunction with the driving shaft imparting motion to the connecting and guide rods carrying therewith the reciprocating cylinder head, first toward the piston then in the same direction with the piston, but at a speed somewhat slower than said piston, and mutilated gears located on the driving shaft for operating the gear levers, substantially as specified.

2. An air compressor comprising a cylinder rigidly and horizontally mounted; a piston operating therein; a reciprocating cylinder head located in the cylinder; a driving shaft; gear levers; rods connecting the levers with the piston head and mutilated gears located on the shaft whereby motion is imparted to the levers for operating the cylinder head first toward the piston and then in the same direction with it but at a speed slower than the piston, substantially as specified.

3. An air compressor comprising a stationary cylinder; a driving shaft; a piston operating in said cylinder and operated by the driving shaft; a reciprocating cylinder head located in the cylinder; an inlet and a discharge valve located in the reciprocating cylinder head whereby air is admitted into and discharged from the cylinder; a pair of guide rods located on each side of the cylinder and extending from the reciprocating cylinder to the driving shaft; a cross-bar supporting the reciprocating cylinder head and the ends of the guide rods; a pair of gear levers pivotally located beneath the driving shaft and connected to the guide rods; a pair of mutilated gears located on the driving shaft and communicating with the gear levers so as to operate the reciprocating cylinder head first toward the piston and then in the same direction with it but at a speed slower than said piston, substantially as specified.

In testimony whereof, I have signed my name to this specification, in presence of two subscribing witnesses.

GUSTAV C. VOLLMER.

Witnesses:
L. A. L. McIntyre,
Walter C. Stein.