A. H. GIBSON.

MINING MACHINERY.

APPLICATION FILED NOV. 15, 1905.

915,949. **Patented Mar. 23, 1909.**

3 SHEETS—SHEET 1.

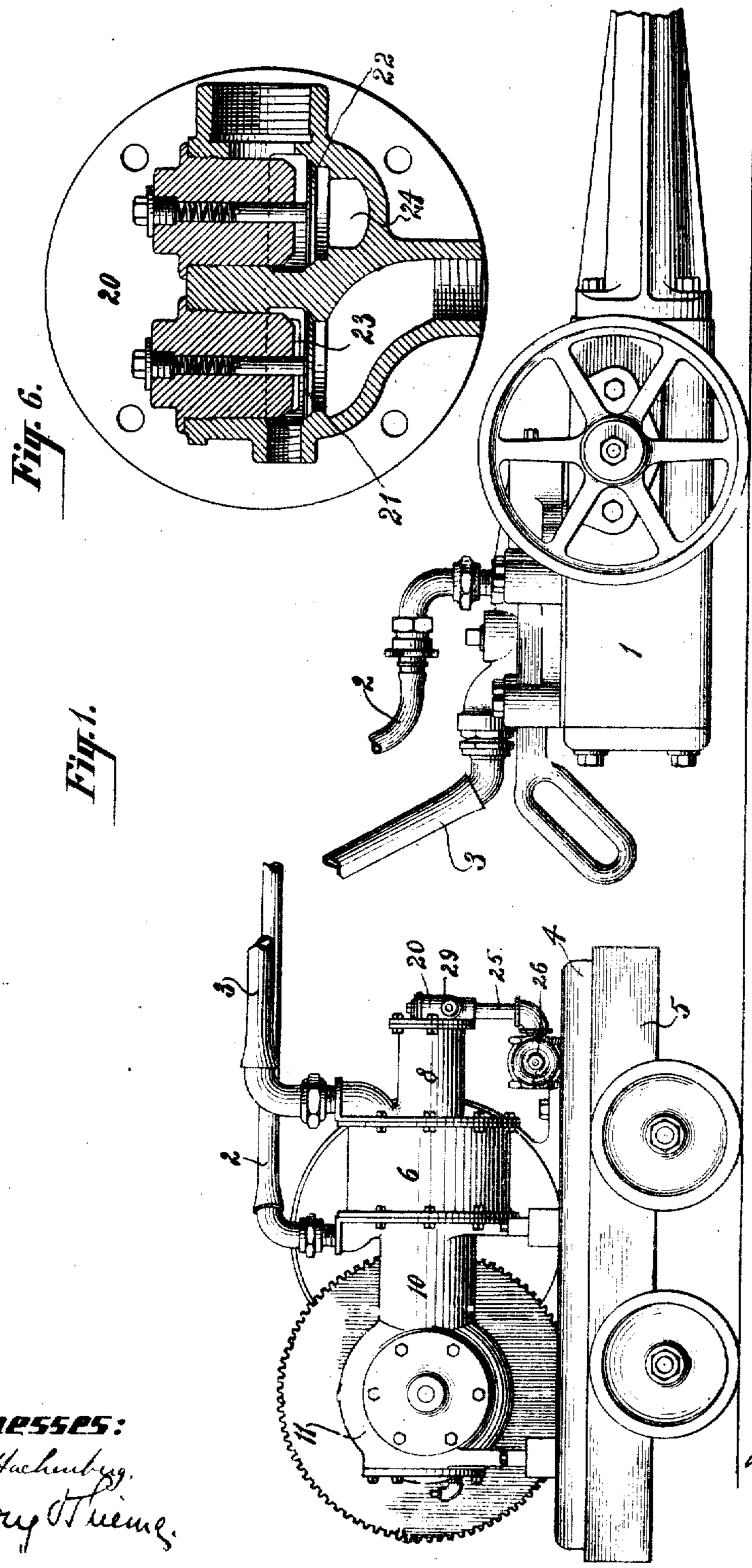

Fig. 1.

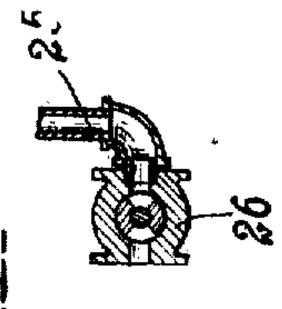

Fig. 1b

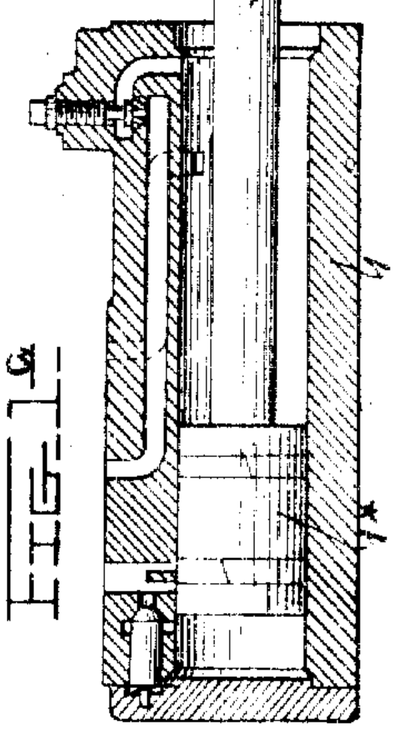

Fig. 1a

Fig. 6.

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3 SHEETS—SHEET 2.

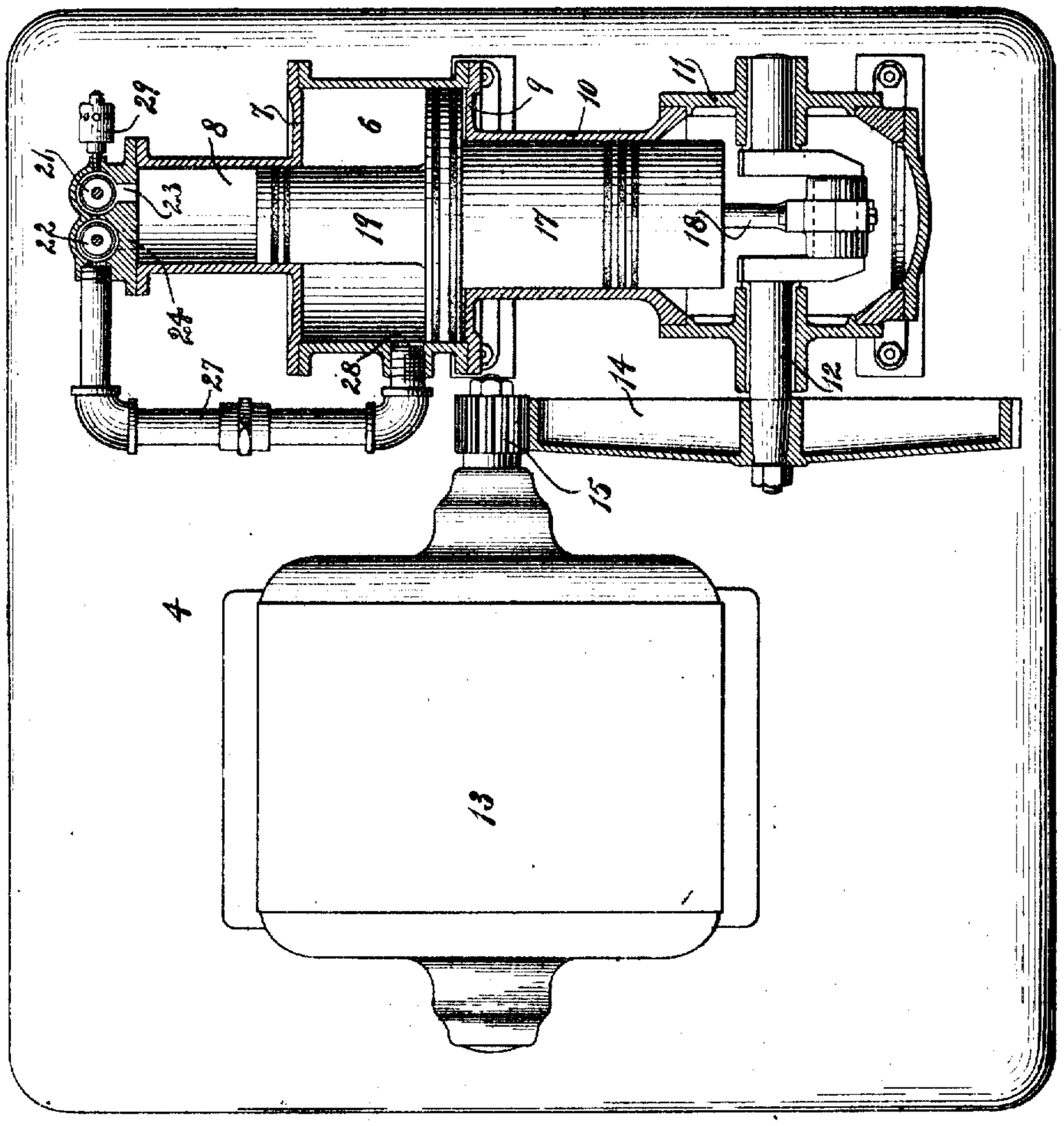

Fig. 2.

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3 SHEETS—SHEET 3.

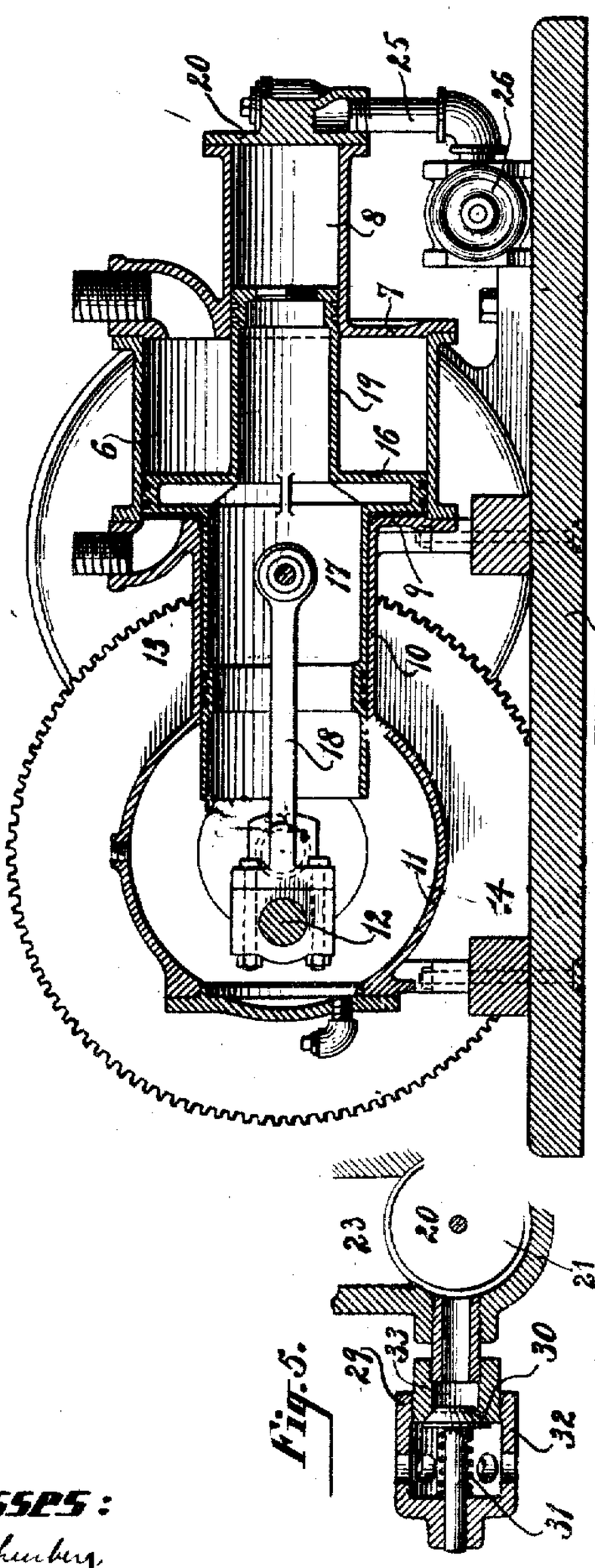

Fig. 3.

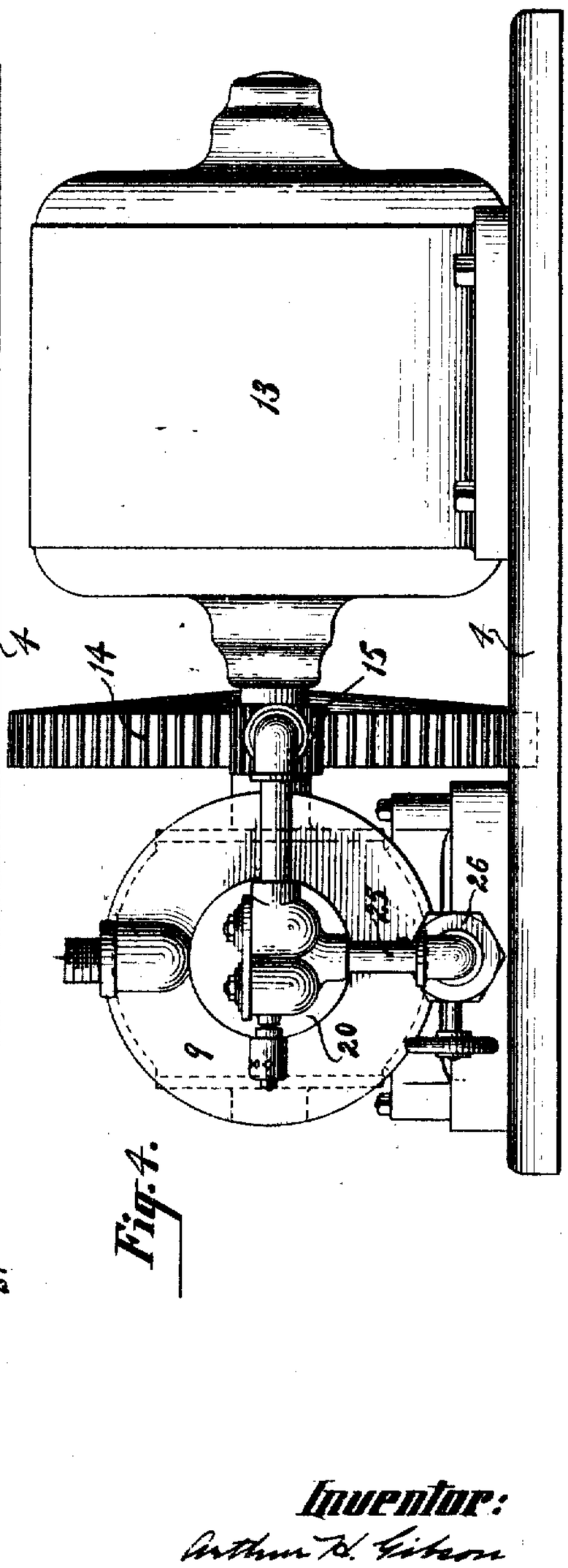

Fig. 4.

Fig. 5.

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UNITED STATES PATENT OFFICE.

ARTHUR H. GIBSON, OF EASTON, PENNSYLVANIA, ASSIGNOR TO INGERSOLL-RAND COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

MINING MACHINERY.

No. 915,949. Specification of Letters Patent. Patented March 23, 1909.

Application filed November 15, 1905. Serial No. 287,400.

To all whom it may concern:

Be it known that I, ARTHUR H. GIBSON, a subject of the King of Great Britain, and resident of Easton, in the county of Northampton and State of Pennsylvania, have invented a new and useful Improvement in Mining Machinery, of which the following is a specification.

My invention relates to improvements in mining machinery and is devoted more particularly to certain improvements in the construction, form and arrangement of the several parts of an air pressor for use in connection with a coal cutting machine whereby the operation and control of the machine is facilitated.

My invention contemplates the following improvements. (1). The provision of an air passage of one capacity connecting the pressor and work cylinders for producing the forward stroke of the work cylinder piston and an air passage of a smaller capacity connecting the two cylinders for producing the return stroke of the work cylinder piston. (2). Means for restricting the suction inlet of the compressor pump whereby the required amount of air only is admitted to the pump to make up for leakage in the apparatus. (3). The provision of a relief valve for the pressor pump in direct communication with the pump itself whereby the pump is relieved when the pressure reaches a predetermined point, thus reducing the power required to operate the pump, and (4) to provide a pressor in which the rear extension of the pressor piston which forms the piston trunk is of larger diameter than the forward extension which forms the trunk of the pump.

In the accompanying drawings, Figure 1 represents a portion of a coal cutting machine in side elevation and an electrically driven air pressor for driving the same, the flexible tubes between the pressor and work cylinders being broken away. Fig. 1ª represents the work cylinder in longitudinal central section with the work cylinder piston and its rod shown therein. Fig. 1ᵇ is a detail section showing the inlet pipe and cock therefor. Fig. 2 is a horizontal section through the pressor, the electric motor for driving the same being shown in top plan. Fig. 3 is a vertical central section through the pressor. Fig. 4 is an end view of the pressor, the electric motor being shown in side elevation. Fig. 5 is a detail sectional view of the relief valve for the pressor pump, and Fig. 6 is another detail section through the inlet and discharge valves of the pressor pump.

The work cylinder of the portable coal cutting machine is denoted by 1, to the front and rear ends of which are attached flexible tubes 2 and 3, leading to the front and back of the work piston 1*. The forwardly extending rod of the work piston which works through the end of the cylinder is denoted by 1**.

An electrically driven air pressor is shown as mounted on the bed plate 4 carried by a wheeled truck 5. The front and rear ends of the air pressor cylinder 6 are connected to the flexible tubes 3 and 2 respectively. The front head 7 of the pressor cylinder is extended to form a pump cylinder 8 and the rear head 9 of the pressor cylinder is provided with a tubular extension 10 which forms a part of a closed crank casing 11 within which a crank shaft 12 is mounted. This crank shaft 12 is driven from a suitable electric motor 13 mounted on the bed plate 4, the connection in the present instance being shown as a spur gear 14 fixed to the crank shaft 12 and a pinion 15 fixed to the electric motor shaft.

The pressor piston is denoted by 16 and it is provided with a rear hollow extension 17 which forms a piston trunk, which trunk is fitted to slide in the tubular extension 10 hereinbefore referred to. A pitman rod 18 connects the piston 16 with the crank shaft 12, whereby a reciprocating movement is imparted to the piston from the said crank shaft.

A forward extension 19 of the pressor piston 16 forms the trunk of the pump and it is fitted to slide in the pump cylinder 8. The diameter of the piston trunk is greater than the diameter of the trunk of the pump so that there is a greater volume of air admitted to and driven from the space in front of the piston than from the space in back of the piston.

The flexible tube 2 which leads from the space back of the pressor piston to the forward end of the work cylinder is smaller in capacity than the flexible tube 3 which leads from the space in front of the pressor piston to the rear end of the work cylinder. The reason for thus making the air passage through the tube 2 smaller than the air pas-

2.

sage through the tube 3 is that the work cylinder 1 of the coal machine has necessarily a smaller capacity in front of the work piston 1* than behind by reason of the large front piston rod 1** which is essential for the attachment of the cutting tool. If the inner side of the air pressor piston was made of greater capacity than the front side of the work cylinder piston there would be not only a waste of energy but it would also necessitate the use of a larger air passage between these points than would be required to get a maximum effect. It would also add a certain amount of extra and useless work to be done at each end of the pressor stroke by moving an extra amount of air into and out of the air passage. Therefore, the piston trunk is made larger than the trunk of the pump for insuring a smaller capacity back of the pressor piston and the flexible tube 2 is made small enough to obtain the proper effect on the front of the work cylinder piston to insure its proper rearward movement.

The head 20 of the pump cylinder forms a housing for the inlet and discharge valves 21, 22. A port 23 leads from the top of the inlet valve into the pump cylinder and a port 24 leads from the pump cylinder to the bottom of the discharge valve 22. A pipe 25 leads from the external atmosphere to the bottom of the inlet valve 21, in which pipe I provide a cock 26 for accurately determining the amount of air which may be drawn therethrough past the inlet valve 21 into the pump cylinder. The reason for regulating the amount of air which may be drawn through the inlet pipe 25 is that when the apparatus is used in connection with coal cutting machines, the air surrounding the machine is filled with coal dust and it is advantageous to admit as little of this dust-filled air into the pump cylinder as may be necessary to accomplish the work to be done and thus reduce the scoring and wearing away of the several parts of the apparatus.

A passage from the top of the discharge valve 22 to the interior of the pressor cylinder intermediate its ends, is provided through a pipe 27. The port 28 of this pipe 27 in the pressor cylinder is so arranged that communication will be established from the top of the discharge valve alternately to the front and rear of the pressor piston.

A relief or safety valve 29 is provided for the pump cylinder, which valve opens to the top of the inlet valve 21, so that it is at all times in open communication with the interior of the pump cylinder through the port 23. This valve is yieldingly held closed on its seat 30 by means of a spring 31 the tension of which may be accurately adjusted by means of a perforated cap 32 which has a screw-threaded engagement with the port 33 in which the valve seat 30 is located. By adjusting this spring 31, the pressure exerted on the valve 29 may be so regulated that the valve will open when the air pressure within the pump cylinder reaches a predetermined point, thus releasing the load from the pump before the pressure reaches a higher degree than that required for supplying air under the proper pressure to the one or the other side of the pressor piston.

From the above description it will be seen that all unnecessary loads are removed from the air pressor, thus permitting the same to economically do the work required. Furthermore, unnecessary wear of the parts is obviated.

In operation; the coal machine and the truck carrying the pressor and its motor, are readily moved together to the point where operations are to be begun. The coal machine is then placed in position and because of the flexible tube connection between the coal machine cylinder and the pressor cylinder, the coal machine may be fed to its work without disturbing the pressor truck. When the parts are in position, the motor is started, thereby starting the operation of the pressor. As the pressor piston reciprocates, it will reciprocate the columns of air through the tubes and thus cause the reciprocation of the coal machine piston and thereby the tool proper. The required amount of air may be fed to the pump for raising the air to the desired point in the system and the relief valve for the pump will prevent unduly loading the pump for the most efficient service.

While United States Letters Patent No. 841,140 granted to me January 15, 1907, shows a pump for raising pressure in the system, one feature of my present invention is directed to means for regulating the amount of air drawn through the inlet valve of the pump.

What I claim as my invention is:

1. A work cylinder, a work cylinder piston having its rod working through the end of the cylinder, an air pressor cylinder, a pressor piston, a pump having its trunk connected with the front of the piston, the said piston having a rearwardly extended trunk of greater diameter than the trunk of the pump, an air passage of one capacity connecting the rear end of the work cylinder with the front end of the pressor cylinder and an air passage of lesser capacity connecting the front end of the work cylinder with the rear end of the pressor cylinder.

2. A work cylinder, work cylinder piston having its rod working through the end of the cylinder, an air pressor cylinder, a pressor piston, a pump having its trunk connected with the front of the pressor piston, the said pressor piston having a rearwardly extended trunk of greater diameter than the

trunk of the pump, a flexible air tube connecting the rear end of the work cylinder with the front end of the pressor cylinder and a second smaller air tube connecting the front end of the work cylinder with the rear end of the pressor cylinder.

3. A pressor cylinder, air passages leading therefrom, a pressor piston, a pump, its inlet and discharge valves, a passage leading from the discharge valve to the cylinder and arranged to be alternately opened to the opposite sides of the pressor piston and means for regulating the amount of air drawn through the inlet valve of the pump.

4. A pressor cylinder, air passages leading therefrom, a pressor piston, a pump, its inlet and discharge valves, a passage leading from the discharge valve to the cylinder arranged to be alternately opened to the opposite sides of the pressor piston, an air admission pipe for the inlet valve and a cock in said pipe for accurately determining the amount of air which may be drawn through the inlet valve into the pump.

5. A pressor cylinder, air passages leading therefrom, a pressor piston, a pump, its inlet and discharge valves, a passage leading from the discharge valve to the cylinder arranged to be alternately opened to the opposite sides of the pressor piston and a valve for automatically relieving the pressure in the pump when it reaches a predetermined point.

6. A pressor cylinder, air passages leading therefrom, a pressor piston, a pump, its inlet and discharge valves, a passage leading from the discharge valve to the cylinder arranged to be alternately opened to the opposite sides of the pressor piston, a valve for automatically relieving the pressure in the pump when it reaches a predetermined point and means for adjusting the said valve.

7. A pressor cylinder, passages leading therefrom, a pressor piston, a pump, its inlet and discharge valves, a passage leading from the discharge valve to the cylinder arranged to be alternately opened to the opposite sides of the pressor piston, and a relief or safety valve opening to the top of the inlet valve whereby it is at all times in open communication with the interior of the pump for relieving pressure therein when it reaches a predetermined point.

In testimony, that I claim the foregoing as my invention, I have signed my name in presence of two witnesses, this 13th day of November 1905.

ARTHUR H. GIBSON.

Witnesses:
FREDK. HAYNES,
HENRY THIEME.