A. H. GIBSON.

COAL MINING MACHINE.

APPLICATION FILED JULY 28, 1905.

944,029. Patented Dec. 21, 1909.

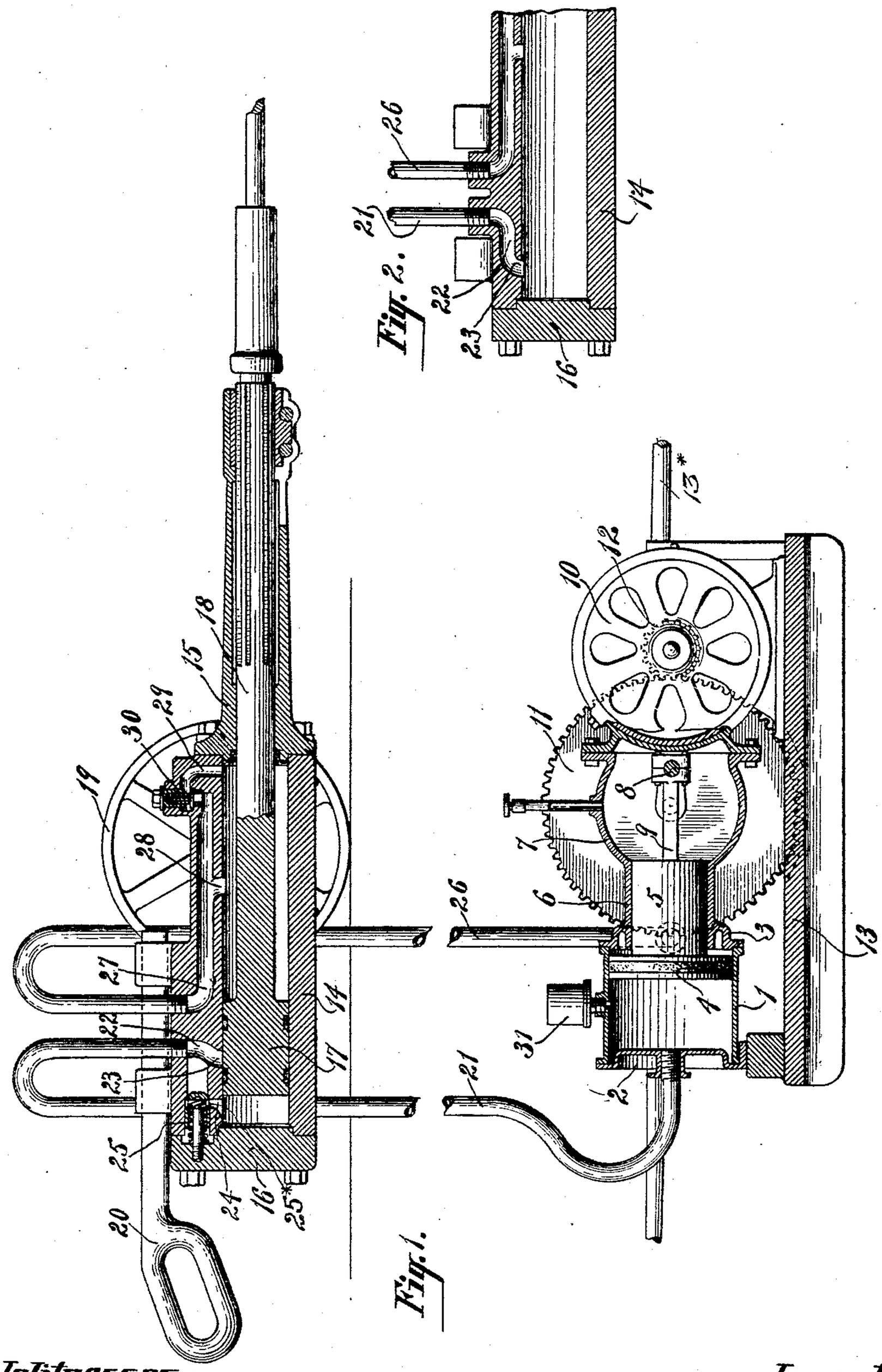

Fig. 1.

Fig. 2.

Witnesses:

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UNITED STATES PATENT OFFICE.

ARTHUR H. GIBSON, OF EASTON, PENNSYLVANIA, ASSIGNOR TO THE INGERSOLL-SERGEANT DRILL COMPANY, OF NEW YORK, N. Y., A CORPORATION OF WEST VIRGINIA.

COAL-MINING MACHINE.

944,029. Specification of Letters Patent. Patented Dec. 21, 1909.

Application filed July 28, 1905. Serial No. 271,603.

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 Coal-Mining Machines, of which the following is a specification.

The object of my invention is to provide certain improvements in the means for supplying air to the operating piston of a coal mining machine whereby the piston is cushioned at both ends of its stroke by air pressure in a novel and simple manner.

In the accompanying drawings, Figure 1 represents a coal mining machine in longitudinal section partially in side elevation and a portable electrically operated pressor for reciprocating columns of air to operate the mining machine, the said pressor being shown partially in longitudinal central section and partially in side elevation, and Fig. 2 is a detail longitudinal central section showing a modified arrangement of the ports at the back of the work piston cylinder whereby the check valve at this point is eliminated.

The pressor cylinder is denoted by 1, its front head by 2 and its rear head by 3.

The pressor piston is denoted by 4 and its trunk by 5. This trunk is fitted to slide in a tubular extension 6 in the rear head 3, which tubular extension also forms part of the crank casing 7.

The crank shaft is denoted by 8 and it is connected through the usual pitman rod 9 with the trunk 5 of the pressor piston 4. This crank shaft 8 is driven from an electric motor 10 of any well known and approved form, through gears 11 and 12. The pressor, its crank casing and motor are all mounted on a portable platform 13 so that the same can be readily moved from place to place so as to keep the pressor at all times in proximity to the coal mining machine and thus eliminate to a considerable degree the power required to transmit air from the pressor to the opposite sides of the work piston. This portable platform 13 may be moved from place to place by any desired means, as, for instance, by providing the platform with suitable handles 13*, one of which handles is shown in Fig. 1.

The coal mining machine cylinder is denoted by 14, its front head by 15 and its rear head by 16.

The work piston which is fitted to slide in the cylinder 14, is denoted by 17, the rod 18 of which piston being attached in any suitable manner to the cutting tool, not shown herein. This coal mining machine is provided with the usual traction wheels 19 one of which is shown herein and the usual guiding handle 20. A flexible tube 21 leads from the pressor cylinder 1 in front of the piston 4, to a passage 22 in the work cylinder 14, which passage is provided with a port 23 opening into the cylinder chamber at a short distance from the rear head 16. A branch port 24 leads from the work cylinder 14 at its back end to the passage 22, through a spring-actuated check valve 25 which is arranged to be opened from pressure within the tube 21 and to be closed by pressure from the interior of the cylinder 14 through the port 24 and holes 25* in the side walls of the valve for permitting air to get back of the valve. A second flexible tube 26 leads from the pressor cylinder 1 at the back of its piston 4, to a passage 27 in the work cylinder 14 of the coal mining machine. This passage 27 is provided with a port 28 opening into the work cylinder 14 in front of its piston 17, a considerable distance from the front end of the said cylinder. A branch port 29 leads from the work cylinder at its front end to the passage 27, through a spring-actuated check valve 30, which check valve is arranged to open by pressure from the tube 26 and to close by pressure from the interior of the cylinder 14, through the port 29.

Air may be supplied to the interior of the pressor cylinder alternately to the one and the other side of the piston 4, through a suitable induction valve 31. It is to be understood that the capacities of the pressor and work cylinders should be substantially equal to produce the best results.

In operation, as the pressor piston 4 is moved toward its front head 2, it will force a column of air through the tube 21 into the passage 22 and from thence by the check valve 25, through the port 24 into the work cylinder at the back of its piston 17. This will start the piston 17 in its forward movement and as soon as the port 23 is opened the full force of the column of air will then be

brought to bear on the said piston. At the same time, the advance movement of the piston 17 and piston 4 will cause the air to escape from the chamber in front of the piston 17, through the port 28, into the passage 27 and from thence through the tube 26 into the pressor cylinder back of its piston 17. As soon as the work piston 17 closes the port 28, the additional forward movement of the piston 17 will be cushioned by the compression of air between it and the front end of the cylinder owing to the closure of the check valve 30 to the escape of air from the port 29 to the passage 27. As the pressor piston 4 is started in its reverse movement, it will force a column of air through the tube 26 into the passage 27 in the work cylinder 14 and from thence first past the check valve 30 through the port 29 into the work cylinder in front of its piston 17. As the piston 17 moves rearwardly, it will uncover the port 28 so that the full pressure of air from within the tube 26 will be brought to bear on the piston. As this piston 17 moves rearwardly, it will cause the air to flow out through the port 23 into the passage 22 and from thence to the tube 21 into the presser cylinder in front of its piston 4. As the work piston 17 nears the limit of its inward movement, it will cut off the port 23 and because of the port 24 being closed by the check valve 25, it will compress air in the cylinder chamber for cushioning the back stroke of the said piston.

When the piston 17 is at the limit of its forward movement, it will be seen that the ports 23 and 28 of the two tubes are brought into open communication with each other in back of the piston so as to equalize the pressure in the two tubes and thus facilitate the reciprocation of the columns of air therein. The rebound of the piston 17 is sufficient to open up the auxiliary front port 29 and thus overcome the equilibrium established when the piston is between the ports 28 and 29.

In Fig. 2 there is shown a modified form in which the use of the check valve 25 is obviated, the port 23 leading from the passage 22 in this instance being located a sufficient distance to the front of the back head 16 of the work cylinder to produce a cushion between the piston 17 and the back head after the port 23 has been closed by the piston, the port 23 at the same time being sufficiently near to admit air to the back of the piston as it rebounds from its air cushion.

It is to be understood that this device is more particularly applicable for slow moving pistons and I have herein shown it in connection with a coal mining machine wherein this slow movement is desirable for producing the best effects.

What I claim as my invention is:

1. In combination with the cylinder of a coal mining machine and its piston, said cylinder having a main front port spaced a considerable distance from the front end of the cylinder, a main back port spaced a short distance from the rear end of the cylinder and an auxiliary front port adjacent to the front end of the cylinder, of a check valve between the auxiliary front port and the main front port, air tubes connected to the main front and back ports and an air pressor for reciprocating columns of air in the said tubes.

2. In combination with the cylinder of a coal mining machine and its piston, said cylinder having a main front port spaced a considerable distance from the front end of the cylinder, a main back port spaced a short distance from the rear end of the cylinder and an auxiliary back port located adjacent to the back end of the cylinder, of a check valve interposed between the said auxiliary back port and the main back port, air tubes connected to the main front and back ports and an air pressor for reciprocating columns of air in the said tubes.

3. In combination with the cylinder of a coal mining machine and its piston, said cylinder having a main front port spaced a considerable distance from the front end of the cylinder, a main back port spaced a short distance from the rear end of the cylinder and an auxiliary front port adjacent to the front end of the cylinder of a check valve between the auxiliary front port and the main front port, said cylinder also having an auxiliary back port located adjacent to the back end of the cylinder, a check valve between said auxiliary back port and the main back port, air tubes connected to the main front and back ports and an air pressor for reciprocating columns of air in the said tubes.

4. A pressor cylinder and its piston, a coal mining machine cylinder and its piston, air tubes connecting the two cylinders, the mining machine cylinder having passages leading from the said tubes, and having front and back ports opening from said passages into the piston chamber at predetermined distances from the ends of the cylinder, said mining machine cylinder also having an auxiliary front port communicating with the front passage and a check valve interposed between said auxiliary front port and the main front port, the said front and back ports being arranged to be opened and closed by the movement of the piston.

5. A pressor cylinder and its piston, a coal mining machine cylinder and its piston, air tubes connecting the two cylinders, the mining machine cylinder having passages leading from the said air tubes, and having front and back ports opening from said passages into the piston chamber at predetermined distances from the ends of the cylinder, said mining machine cylinder also hav-

ing an auxiliary back port opening into the piston chamber at the rear end thereof and communicating with the back passage and a check valve interposed between the auxiliary back port and the main back port, the said ports being arranged to be opened and closed during the reciprocating movement of the piston.

6. A pressor cylinder and its piston, a coal mining machine cylinder and its piston, air tubes connecting the two cylinders, the mining machine cylinder having passages leading from the air tubes, and having front and back ports opening from said passages into the piston chamber at predetermined distances from the ends thereof, said mining machine cylinder also having auxiliary front and back ports communicating with said passages and opening into the piston chamber at the ends thereof and check valves interposed between the auxiliary ports and their front and back ports, the said ports being arranged to be opened and closed by the reciprocating movement of the piston.

In testimony, that I claim the foregoing as my invention I have signed my name in presence of two witnesses, this twenty fourth day of July 1905.

ARTHUR H. GIBSON.

Witnesses:
H. D. Maxwell,
Frank P. McCluskey.