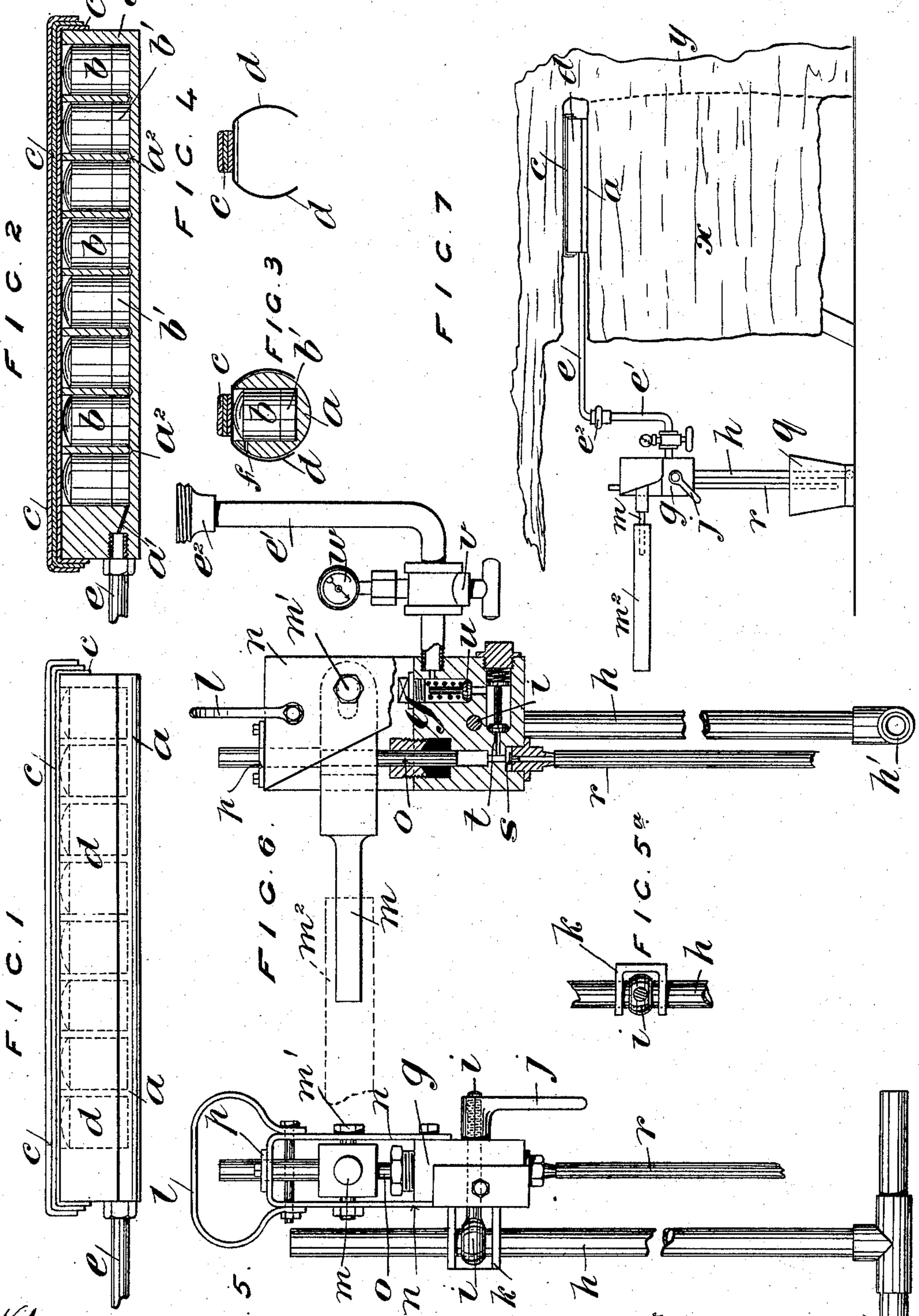
(No Model.)

W. G. GASS & J. TONGE.

HYDRAULIC APPARATUS FOR MINING PURPOSES.

No. 590,973. Patented Oct. 5, 1897.



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HYDRAULIC APPARATUS FOR MINING PURPOSES.

SPECIFICATION forming part of Letters Patent No. 590,973, dated October 5, 1897.

Application filed April 13, 1897. Serial No. 631,993. (No model.) Patented in England March 23, 1897, No. 7,441.

To all whom it may concern:

Be it known that we, WILLIAM GEORGE GASS, engineer, of the firm of Entwisle & Gass, Limited, of Atlas Foundry, and JAMES TONGE, mining engineer, of Albany Chambers, Bolton, in the county of Lancaster, England, subjects of the Queen of Great Britain and Ireland, have invented certain new and useful Improvements in Hydraulic Apparatus for Mining Purposes, (for which we have made application for a patent in Great Britain, No. 7,441, dated the 23d day of March, 1897,) of which the following is a specification.

Our said invention relates to improvements in hydraulic apparatus for breaking down coal and minerals in mines, as is well understood. Such breaking down in mines is usually effected by shot-firing; but to this method numerous objections apply.

We are aware that hydraulic apparatus for the same purpose has been proposed, but owing to defects in construction such apparatus has never been practically successful.

The object of our present invention is to remedy such defects and to produce a breaking-down apparatus which will work successfully, while in combination therewith we have devised improvements in the forcing-pump and in the method of connecting the same to the apparatus the effects of which are to facilitate its application and render its operation more certain.

In order that our said invention may be more clearly understood, we will now proceed to describe the same with reference to the annexed sheet of illustrative drawings.

Figure 1 is a longitudinal side view of a chambered bar containing a series of hydraulic rams. Fig. 2 is a longitudinal section. Fig. 3 is a cross-section of the bar. Fig. 4 is a cross-sectional view of a protecting metallic clip to box in the rams and protect them from dirt. Fig. 5 is an end elevation of the force-pump for creating the hydraulic pressure. Fig. 5ª is a detail view. Fig. 6 is a side view of the pump, partly in section. Fig. 7 is a general view of the bar and pump in working position.

The improved apparatus consists of an expandable body or bar *a*, intended to be inserted in a hole in the coal or mineral drilled to receive it and above the mass which it is desired to break down, as shown in Fig. 7. This expandable body or bar *a* consists of two chief parts—viz., the main portion or ram-box *a*, containing a number of hydraulic rams *b*, and one, two, three, or more separate covers *c c c*, which rest upon the rams, or, rather, upon the metallic clip *d*, which covers in the rams. The rams *b* are merely cylinders of metal packed at the foot with cup-leathers *b'* and working in a series of separate holes in the ram-box *a*. Small ports a^2, formed through the solid metal separating each of the said ram-holes, establish communication between the ram-holes.

The water is forced in at the front of the ram-box *a* through the pipe *e* and along the port *a'* to the first ram-chamber, the pressure thus finding its way beneath the whole of the rams *b*. The top of the rams where they bear against the inner side of the clip *d* and superimposed covers *c c c* are dome-shaped and provide for any lateral rocking or relative movement or displacement of the covers and the ram-box, the covers merely rolling upon the dome-shaped crowns of the rams without straining or disturbing the rams in their cylinders. This prevents jamming and possible breakage and leakage of the apparatus. To prevent the covers from slipping longitudinally upon the ram-box, we turn them down at the ends, so that they clip over each other loosely and over the ends of the ram-box, thus mutually preventing relative movement. Also, to prevent dust or dirt from having access to the rams, we place over the top of the ram-box or attach to the inner cover *c* of the series a metallic protector-clip *d* of thin sheet-steel or other suitable metal and projecting sufficiently far on each side to embrace and partly surround the ram-box, as seen in Fig. 3, for example. Thus when not in working position the apparatus can be handled as if it were a homogeneous body.

To prevent the rams from being raised too high in the ram-box, we provide relief-holes *f* at the point beyond which it would be unsafe to raise the rams.

The covers *c c c* are made multiple because if one strong cover is used it is apt to be bent and cannot easily be straightened on the spot, whereas the several covers *c* when combined are of sufficient strength, with the added advantage that if bent they can singly be more

easily straightened. Moreover, if one cover only were used if the hole drilled for the reception of the apparatus is of much larger diameter than the apparatus the cover is raised to some extent before bearing against the coal or other mineral being operated upon and a serious loss in efficient working ensues, whereas by the employment of multiple covers it would only be necessary to apply additional covers until the apparatus was brought to bear directly upon the coal. The full power of the apparatus could thus be exerted.

The front end of the ram-box *a* is connected by tubing *e e'* (see Fig. 7) to the portable force-pump *g*. The pump is supported on a tubular bar *h*, having a cross-piece *h'* at the foot. The pump is adjustably attached to the said bar *h* by an eyebolt *i*, the eye of which embraces the bar *h*, while the screwed tail passes loosely through the body of the pump, the bolt being tightened or slackened by a screwed handle or wrench *j*.

To assist the gripping action of the bolt-eye on the bar *h*, we reinforce it by the addition of a trough or other suitably-shaped slip-binder bracket *k*. (Shown in Fig. 5 and also in side view in the separate detail view, Fig. 5ª.)

One side of the bracket rests against the body of the pump and thus supports and prevents the tube *h* from being bent by the eyebolt, while the pressure of the bracket increases the bite on the tube. The pump can by the indicated means be adjusted to any desired height. The pump is also partially supported by the connecting-tubing *e e'*, these two tubes being united by the coupling e^2. The pump may be lifted and carried about from place to place by the handle *l*. The pump-plunger *o* is worked up and down by the handle *m*, pivoted at *m'* to the side cheeks *n*, the upper end of the plunger *o* being steadied by a guide *p*. The handle *m* has a loose extension m^2, which can be applied when increased leverage is required. Thus pressure may be quickly pumped up with the short handle *m*, the extension m^2 being mounted to increase the leverage when the maximum pressure is being developed. The water is drawn from a bucket or other receptacle (such as *q* in Fig 7) by means of a flexible pipe *r* and passes first through a check-valve *s* to the chamber beneath the plunger.

The flexible pipe *r* is provided at its free end with a gauze strainer or rose to prevent the admission of dirt to the pump-chamber.

From the pump-chamber the water is forced by the downward stroke of the plunger through the valves *t* and *u* and through the tubings *e e'* to the rams *b*. We prefer to use the double valves *t* and *u* for the reason that they increase the security against loss of pressure by back leakage, since if one valve fails the other will hold good.

In practice we have found that to enable the force-pump to be conveniently operated manually in the mines a plunger of small diameter of, say, five-eighths of an inch only, could be used. Where a plunger of larger diameter is used, the extra power required to be exerted could not be conveniently applied in the cramped space within which the apparatus is required to be used. The amount of water pumped at each stroke with a plunger of this area is very small, and owing to leakage of the valve it was found impossible to get up the pressure to more than about fifteen hundredweights per square inch, which was totally inadequate to effect the purpose. By the employment of a second valve the leakage was obviated and actual working pressures from one to two and one-half tons per square inch were obtained. A screw-down valve *v* on the tube *e'* is used to release the pressure beneath the rams *b*. A pressure-gage *w* may be fixed above the valve, as shown, to indicate the pressure.

The whole apparatus is combined and used as shown in Fig. 7. The figure shows a section of coal undercut and spragged at the foot, as usual, and having a hole drilled to receive the expandable bar *a*, as indicated.

When the pressure is pumped beneath the rams, the expansion of the bar *a* due to their movement breaks down the mass of coal, (marked *x*,) as indicated by the dotted line *y*. The expandable bars may be used singly or, when desired, in a series.

We declare that what we claim is—

In hydraulic apparatus for breaking down coal and minerals in mines, the combination with an expandable bar such as *a* of a series of rams made with rounded or dome-shaped tops and employed in conjunction with a series of separate and loose covers *c* and clip-protector *d* for the purposes and substantially as described and shown.

In witness whereof we have hereunto set our hands in presence of two witnesses.

WILLIAM GEORGE GASS.
JAMES TONGE.

Witnesses:
JOSHUA ENTWISLE,
RICHARD IBBERSON.