

No. 717,258.

Patented Dec. 30, 1902.

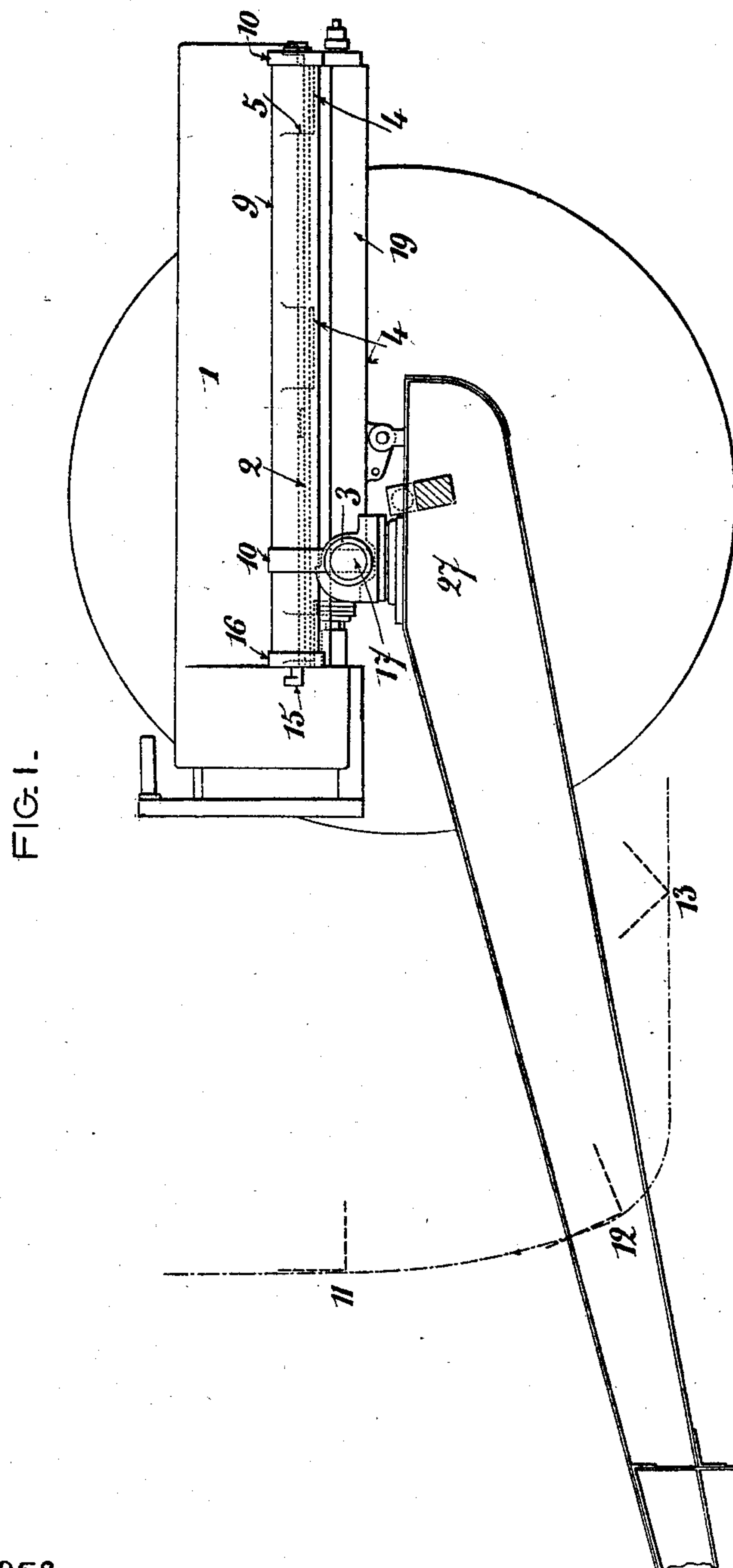
P. DE NORDENFELT & E. TERNSTRÖM.

GUN CARRIAGE.

(Application filed May 29, 1902.)

(No Model.)

4 Sheets—Sheet 1.



WITNESSES

W. M. Avery

W. Harrison

INVENTORS

Per de Nordenfelt
Ernst Ternström

BY

M. M. M.

ATTORNEYS

No. 717,258.

Patented Dec. 30, 1902.

P. DE NORDENFELT & E. TERNSTRÖM.

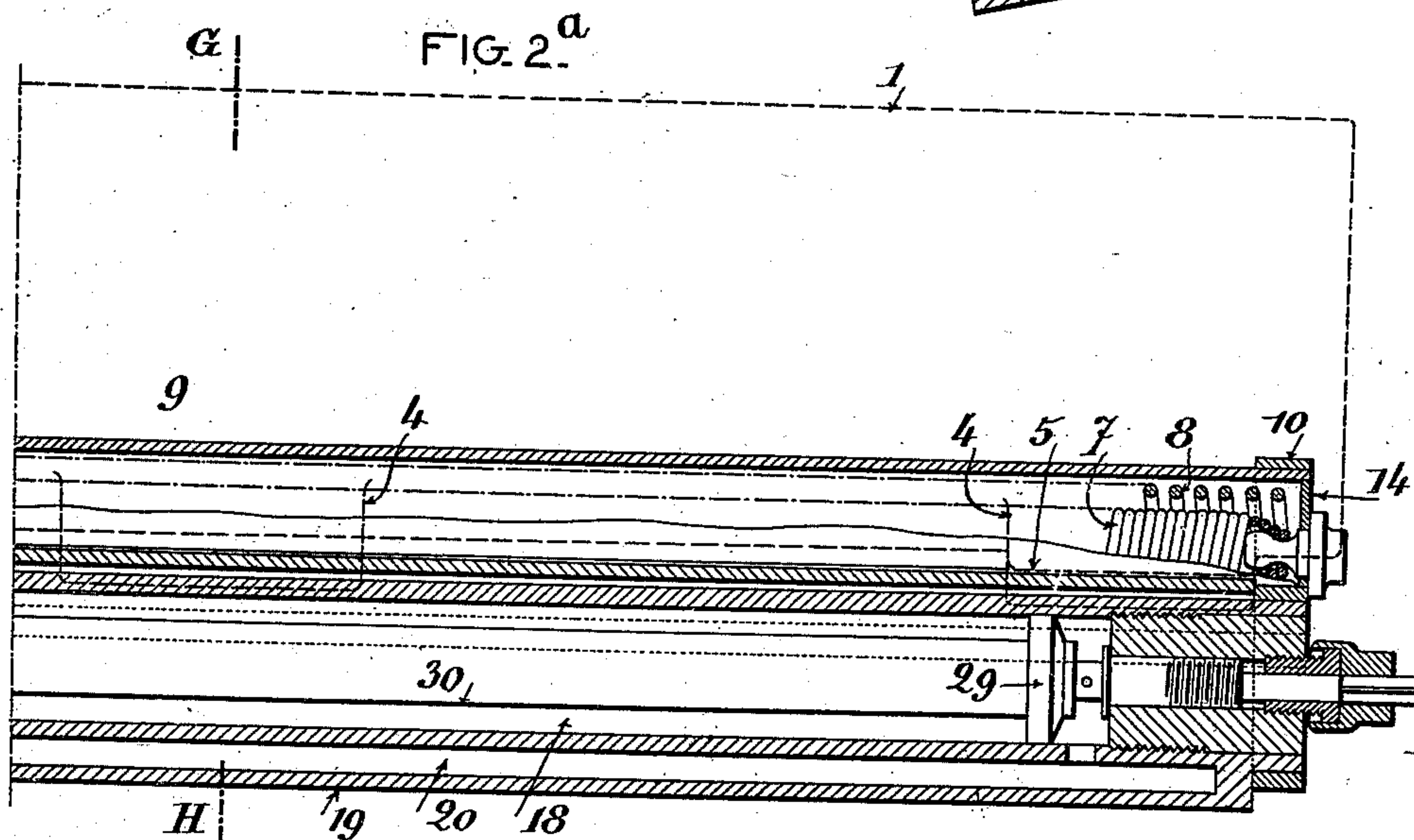
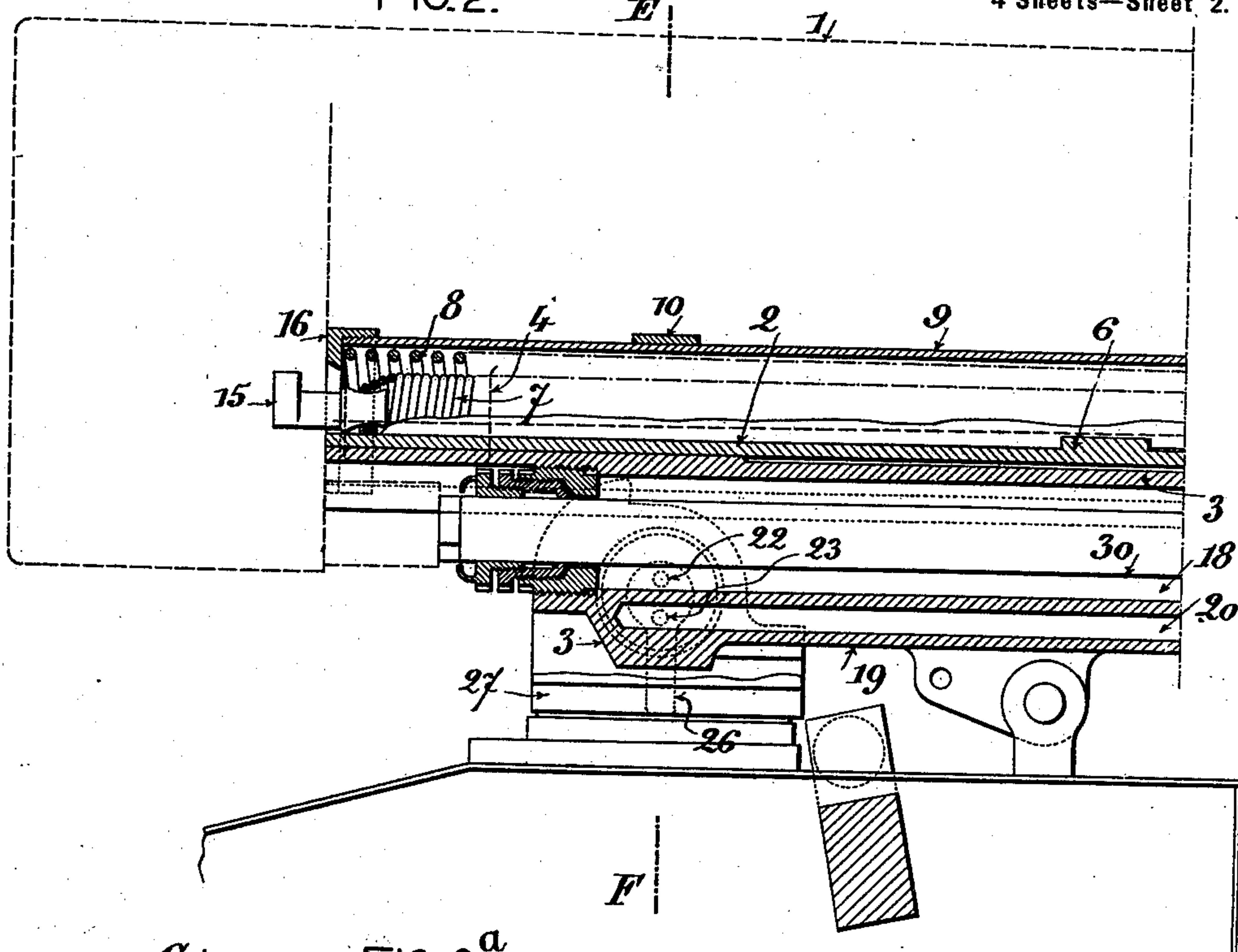
GUN CARRIAGE.

(Application filed May 29, 1902.)

(No Model.)

FIG. 2.

4 Sheets—Sheet 2.



WITNESSES

W. M. Avery

W. Harrison

INVENTORS

Per de Nordenfält
Ernst Ternström

BY

Mum

ATTORNEYS

No. 717,258.

Patented Dec. 30, 1902.

P. DE NORDENFELT & E. TERNSTRÖM.
GUN CARRIAGE.

(Application filed May 29, 1902.)

(No Model.)

4 Sheets—Sheet 3.

FIG. 3.

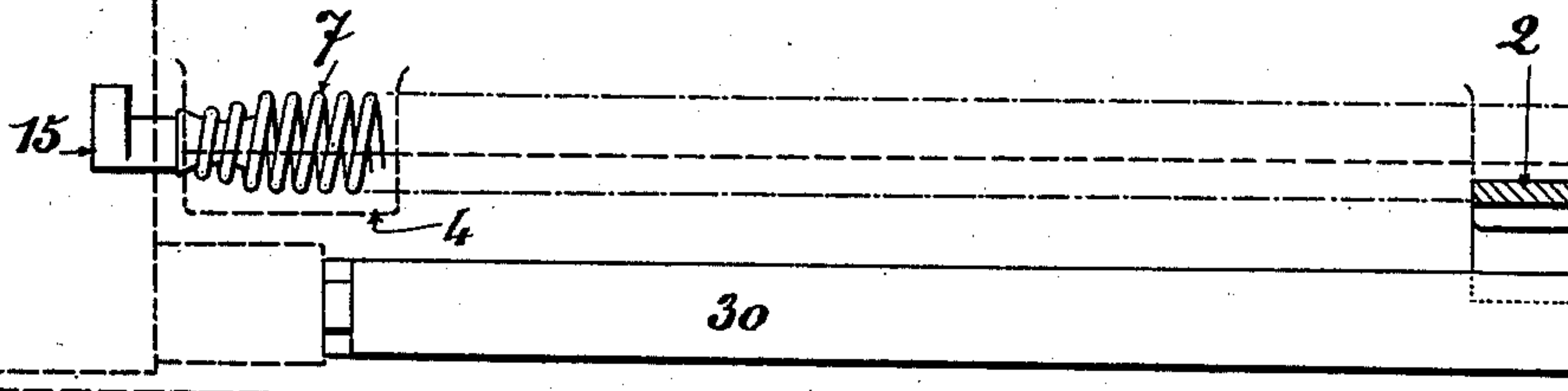


FIG. 3^a.

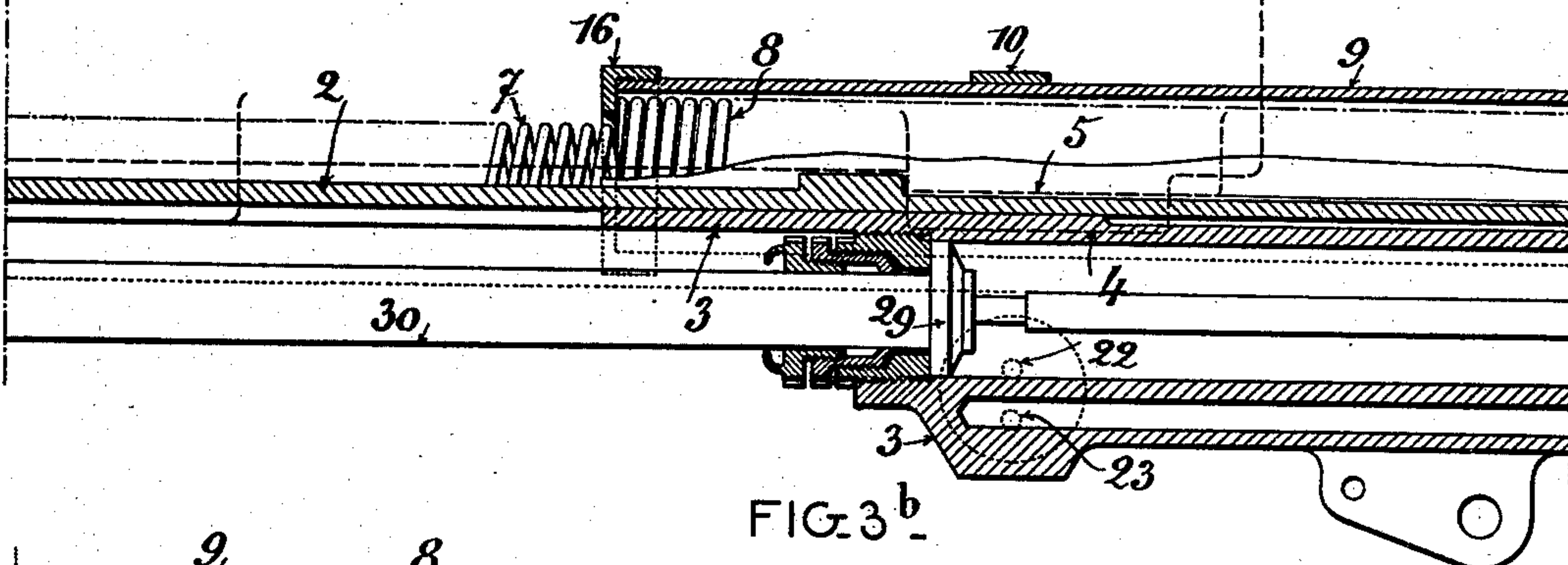
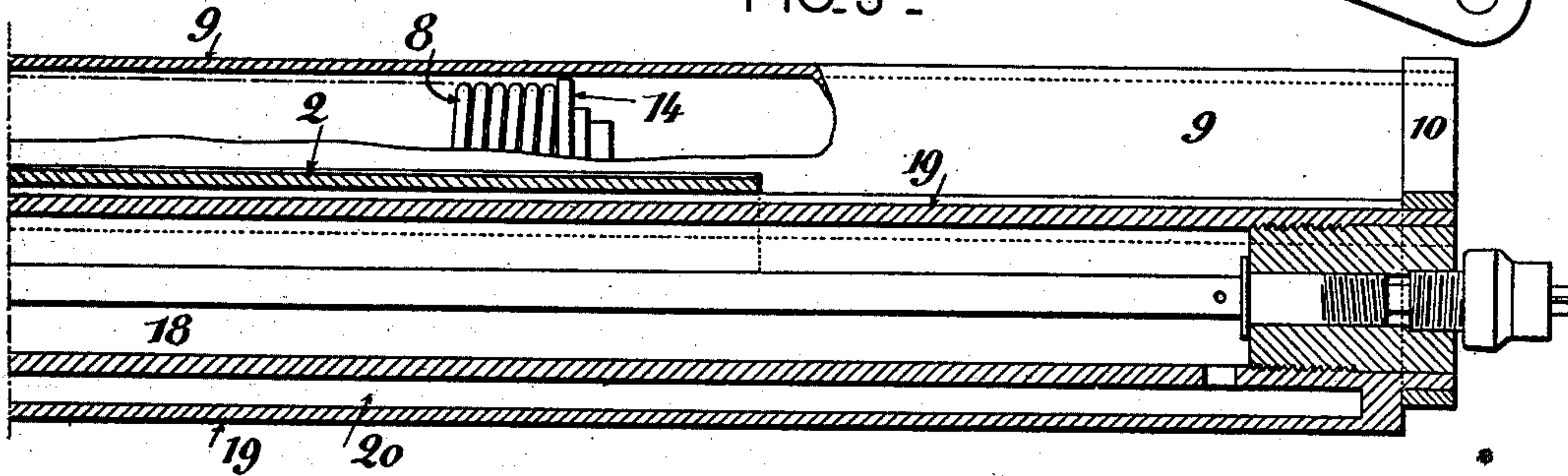


FIG. 3^b.



WITNESSES

W. M. Avery

W. Harrison

INVENTORS

Per de Nordenfält
Ernst Ternström

BY

Munn
ATTORNEYS

No. 717,258.

Patented Dec. 30, 1902.

P. DE NORDENFELT & E. TERNSTRÖM.

GUN CARRIAGE.

(Application filed May 29, 1902.)

(No Model.)

4 Sheets—Sheet 4.

FIG. 4.

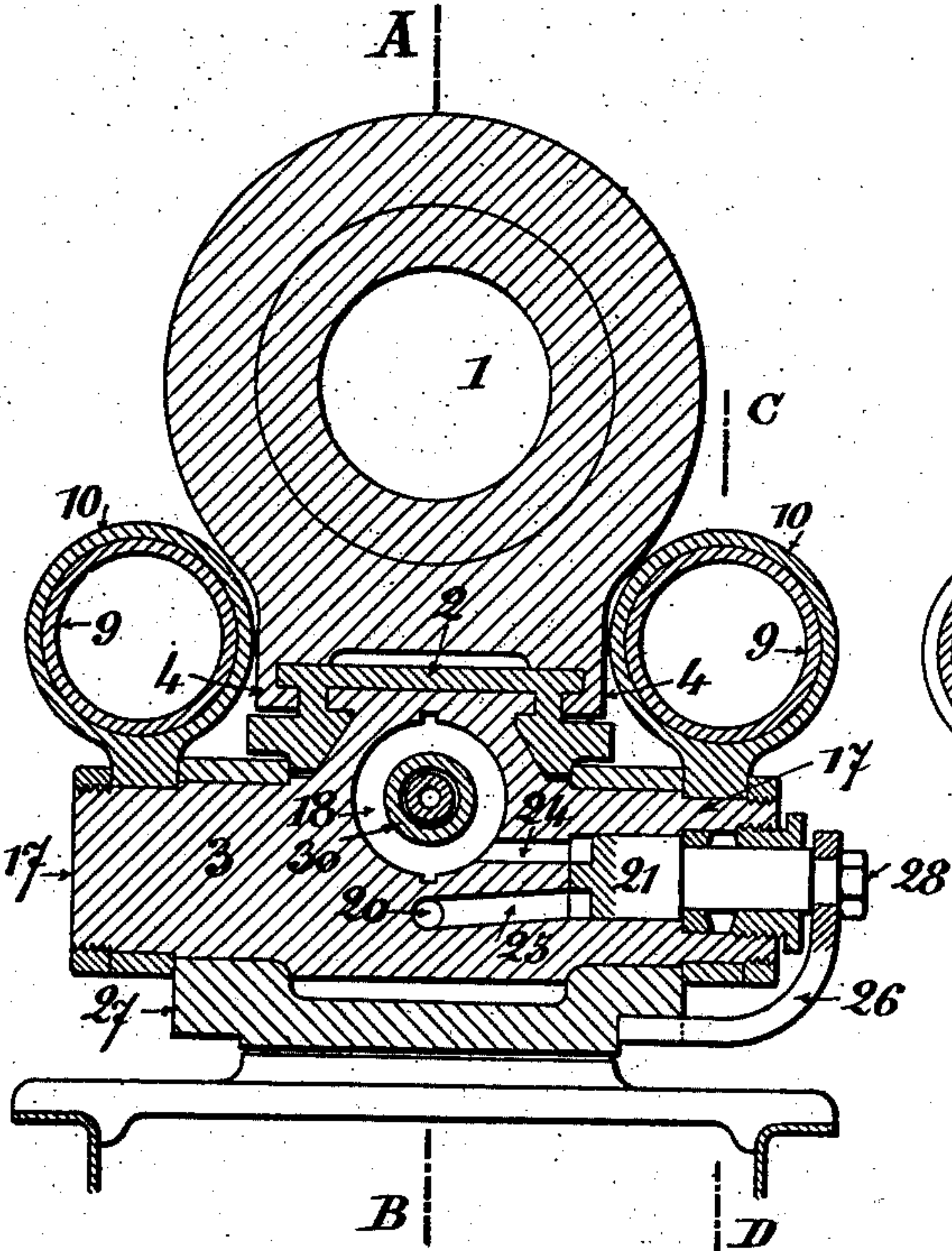


FIG. 5.

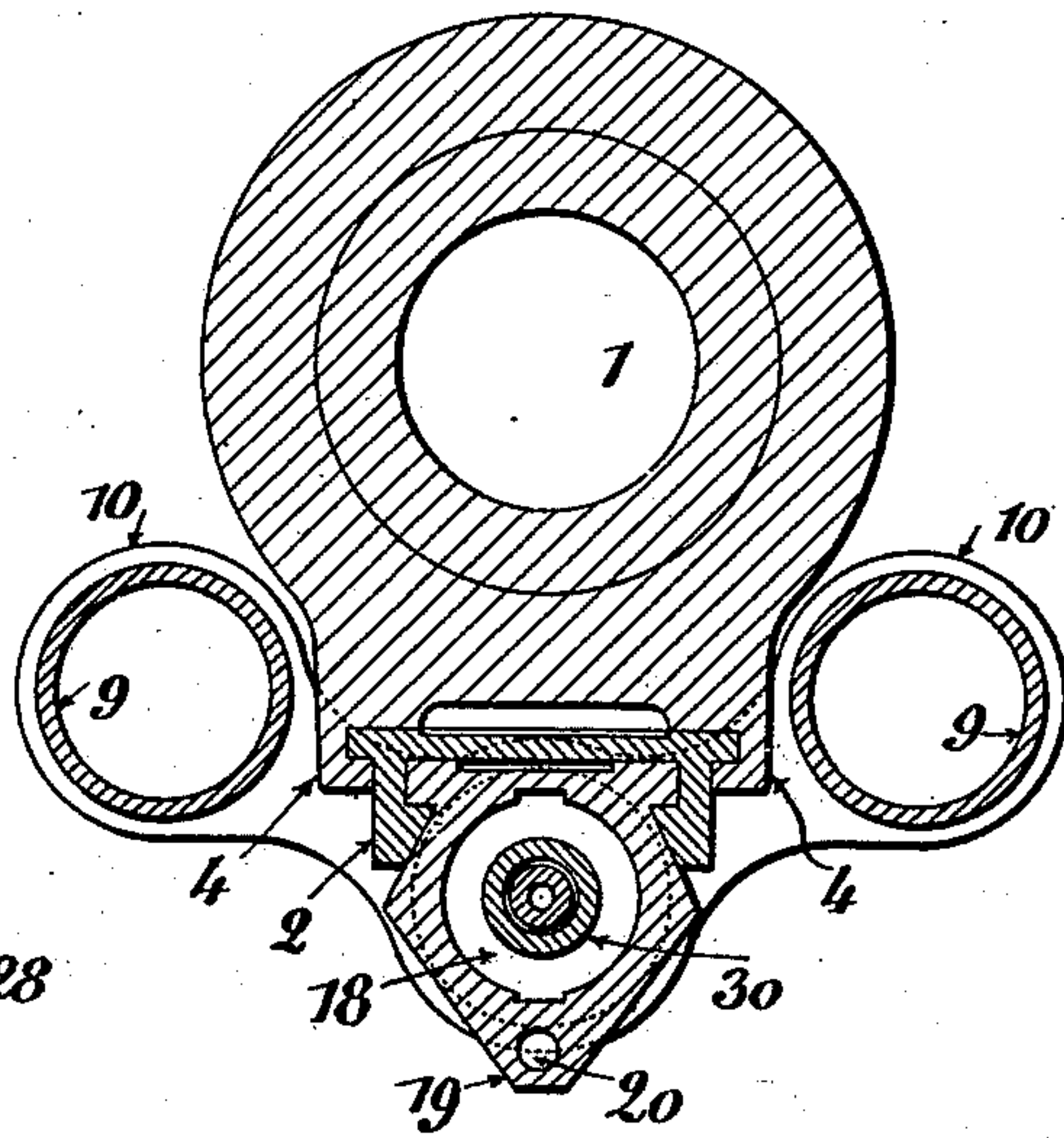
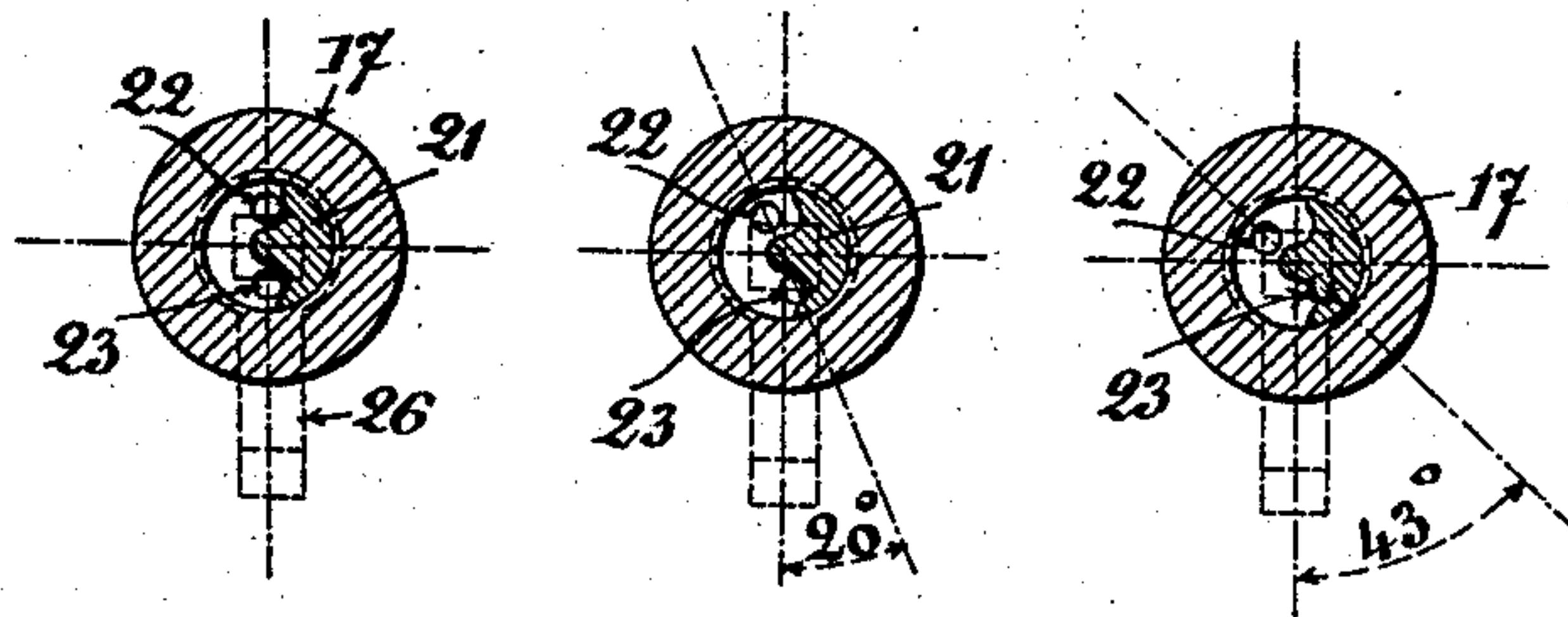


FIG. 6.



WITNESSES

W. M. Avery

W. Harrison

INVENTORS

Per de Nordenfält
Ernst Ternström

BY

Mumford

ATTORNEYS

UNITED STATES PATENT OFFICE.

PER DE NORDENFELT AND ERNST TERNSTRÖM, OF PARIS, FRANCE.

GUN-CARRIAGE.

SPECIFICATION forming part of Letters Patent No. 717,258, dated December 30, 1902.

Application filed May 29, 1902. Serial No. 109,496. (No model.)

To all whom it may concern:

Be it known that we, PER DE NORDENFELT and ERNST TERNSTRÖM, engineers, subjects of the King of Sweden and Norway, residing at 8 Rue Auber, Paris, in the Republic of France, have invented certain new and useful Improvements in or Relating to Gun-Carriages, of which the following is a specification.

The improvements which form the subject of the present application for Letters Patent relate more particularly to short pieces of ordnance or guns provided with hydraulic recoil-stopping devices and capable of being very much inclined, the purpose of such improvements being to allow of considerable recoil on the part of the gun relatively to the carriage without it being necessary for the latter to be very high. To this end we have suitably modified the parts which support and guide the gun, stop its recoil, and bring it forward again. The fact is, that with the arrangement now in use one cannot increase the recoil of the gun because the slideway, coöperating with the cradle, would no longer support the gun when put in recoil for a sufficient part of its length and also because the variation in the length of the returning springs would be too great relatively to their initial length. One is also very limited for a gun of the class specified for the reason that the back part of the gun must not be exposed to come into contact with the ground even when firing at a high angle.

In the improved carriage we are about to describe the slideway which supports the gun is movable in that which concerns both the gun and the cradle. The gun is mounted to slide in the intermediate slide, the latter being also movable in the same direction on a guideway integral with or fixed to the cradle, so that in the false position taken by the gun when recoiling the latter is supported both by the slideway and cradle, which thus properly sustain and guide the same in its long recoil. To follow this long recoil, the returning springs are so divided and arranged that one of them is expanded while the other is contracted, whereby the variation in their respective lengths is reduced by one-half. The shock of the gun against the ground in recoiling when firing at a high angle is also

avoided, in this sense that the resistance offered by the recoil-stopping device is automatically increased as the gun is more inclined, when the inclination goes beyond a certain point by means of a fixed obturator arranged in a hollow trunnion through which communicate two ducts provided in the cradle and connecting the ends of the hydraulic check together, the said obturator being so fitted as to cover the orifices of the said ducts more and more as the cradle is more and more inclined relatively to the said fixed obturator.

The accompanying drawings show for purposes of illustration one form of our invention applied to a short piece of ordnance or gun.

Figure 1 is diagram of the gun and carriage as a whole. Fig. 2 shows the rear part of the hydraulic check and of the intermediate carriage or slide, the latter part being shown in vertical section on the line A B of Fig. 4. Fig. 2 shows also the rear part of the retractile springs of the gun and of the tube surrounding the same in partial vertical section on the line C D of Fig. 4, the gun, assumed as being removed to allow of seeing the said tube and springs, being shown in dotted lines. In the said Fig. 2 the gun is in its position of rest. Fig. 2^a shows in a similar manner the front part of the same members. Figs. 3, 3^a, 3^b represent in a similar way respectively the rear, middle, and front parts of the same members, the gun being in its position of greatest recoil. Figs. 4 and 5 are cross-sections on the lines E F and G H of Figs. 2 and 2^a. Fig. 6 shows an adjusting-obturator in three different positions.

The gun 1 is mounted to slide on an intermediate slide 2, which is also slidable on the cradle 3. For that purpose lugs 4 are formed on the gun and which embrace the edges of the intermediate slide, as shown in Figs. 4 and 5. The recoil of the gun relatively to the intermediate slide is limited by the projection 5 of the gun, which comes into contact with the projection or stop 6 on the intermediate slide. On the other hand, the greatest recoil of the intermediate slide 2 relatively to the cradle 3 is limited by spiral springs 7 and 8, arranged in tubes 9, fixed on the sides of the cradle by means of collars 10. The total recoil of the gun relatively to the cradle is

equal to the sum of the two partial recoils just mentioned, and it can extend to a great length, as shown by the dotted line 11 12 13, Fig. 1. The springs 7 and 8 are arranged
 5 the one within the other and are both attached at their front ends to a piston 14, movable in the tube 9. The rear end of the inner spring 7 is attached to the gun at 15, and the rear end of spring 8 abuts against the
 10 bottom 16 of the fixed tube 9. The result of this arrangement is that the recoil of the gun causes spring 7 to lengthen out and spring 8 to shorten in simultaneously, so that the variation in length of each spring is only a fraction of the total recoil and that the yielding
 15 power of the said springs runs no risk of being exceeded.

When firing at an angle, the long or lengthy recoil which can be obtained by the above-described arrangements should be suitably
 20 reduced to prevent the breech of the gun from striking against the ground in spite of the trunnions 17 of the gun being located so low. For that purpose the passage of the
 25 liquid from the rear chamber 18 of the cylinder 19 of the recoil-stopping device to the front chamber 20 thereof is automatically and gradually reduced as the gun is lowered beyond the inclined position 12, Fig. 1, by means
 30 of a fixed or tight obturator 21, arranged within a hollow trunnion 17, and which obstructs more and more the ducts 22 23 of the channels 24 25, which communicate, respectively, with the chambers 18 and 20 through the cradle.
 35 Obturator 21 is prevented from revolving by means of an arm integral with the frame 27 and of a nut 28, which fixes it adjustably to the said arm. On account of the ducts 22 23 moving relatively to the obturator 21 the said ducts are more and more obstructed as the gun is more and more inclined, (see Fig. 6,) so that the piston 29, attached to the gun by its rod 30, meets with
 40 greater and greater resistance in causing the liquid to pass from the rear to the front of the cylinder 19 of the recoil-stopping device and that the recoil is consequently stopped at a shorter and shorter distance, as shown by the horizontal part 12 13 of line 11 12 13,
 45 Fig. 1.

While our invention applies more particularly to short pieces of ordnance or guns, we reserve to ourselves the exclusive right of applying the hereinbefore-described improvements, either separately or conjointly, to carriages for all classes of pieces of ordnance or

guns, whatever their dimensions and particular arrangements may be.

The adjusting device for the action of the recoil-stopping device may be modified without changing the principle of our invention.

We claim—

1. A carriage for gun of long recoil, comprising the combination, with a frame, a cradle carried thereby, a gun, and a hydraulic device for stopping the recoil, of an intermediate slide mounted to slide on the cradle and on which the gun is mounted to slide, a spiral spring the rear end thereof being attached to the gun, a movable support to which the front end of the said spring is attached, a second spiral spring connected with the first spring and abutting against a fixed support on the cradle and the said movable support, and means to modify the resistance of the hydraulic stopping device in correlation with the inclination of the cradle relatively to the frame, for the purpose of reducing more or less the recoil of the gun.

2. A carriage for a long-recoil gun, comprising the combination, with a frame, a cradle carried thereby, and a hydraulic stopping device, one of the trunnions of the cradle being provided with a cylindrical cavity, and the cradle being provided with two ducts leading, respectively, from the ends of the stopping device to the wall of the said cavity, of an obturator fixed to the frame and arranged in the said cavity, the said obturator serving to obstruct the orifices of the said ducts more or less according to the inclination of the cradle relatively of the frame.

3. A gun-carriage having a long recoil, and comprising the combination, with a frame, a cradle, and a gun, of a tube fixed to the cradle, a rear annular part screwed onto the rear end of the tube, a piston movable in the said tube, a spiral spring attached at the rear end to the gun, and at the front end to the said piston, and another spring arranged between the tube and the first-named spring and abutting, at the rear end, against the said rear annular part and at the forward end, against the said piston.

In testimony that we claim the foregoing as our invention we have signed our names in presence of two subscribing witnesses.

PER DE NORDENFELT.
 ERNST TERNSTRÖM.

Witnesses:

EDMOND BLÉTRY,
 EUGÈNE WATTIER.