Sept. 4, 1928.

1,682,806

C. W. SHERMAN ET AL

FRICTION DRAFT GEAR

Filed July 17, 1926

4 Sheets-Sheet 1

Fig. 1.

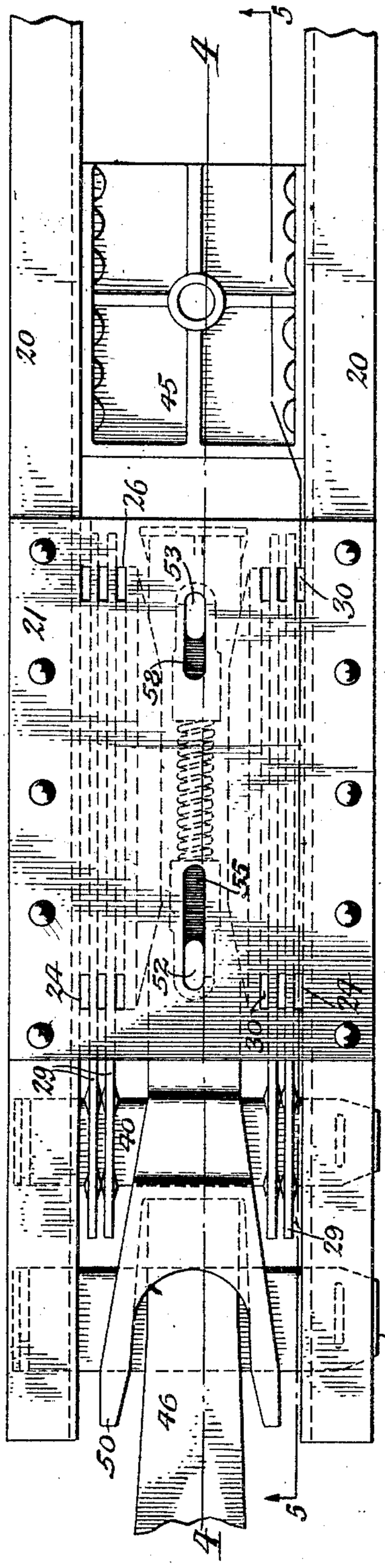
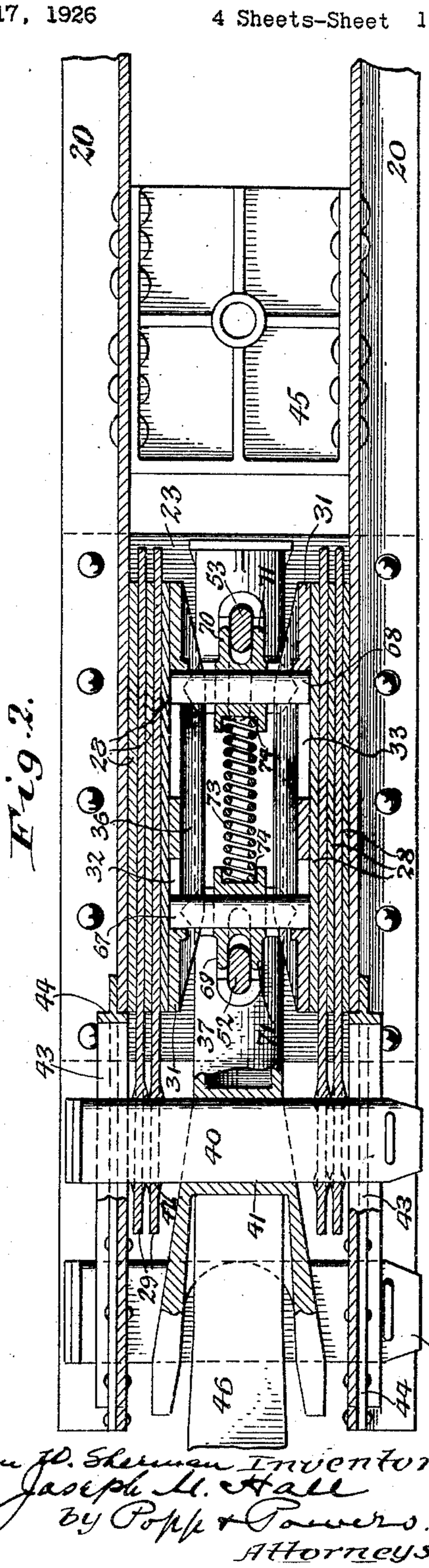


Fig. 2.



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4 Sheets-Sheet 2

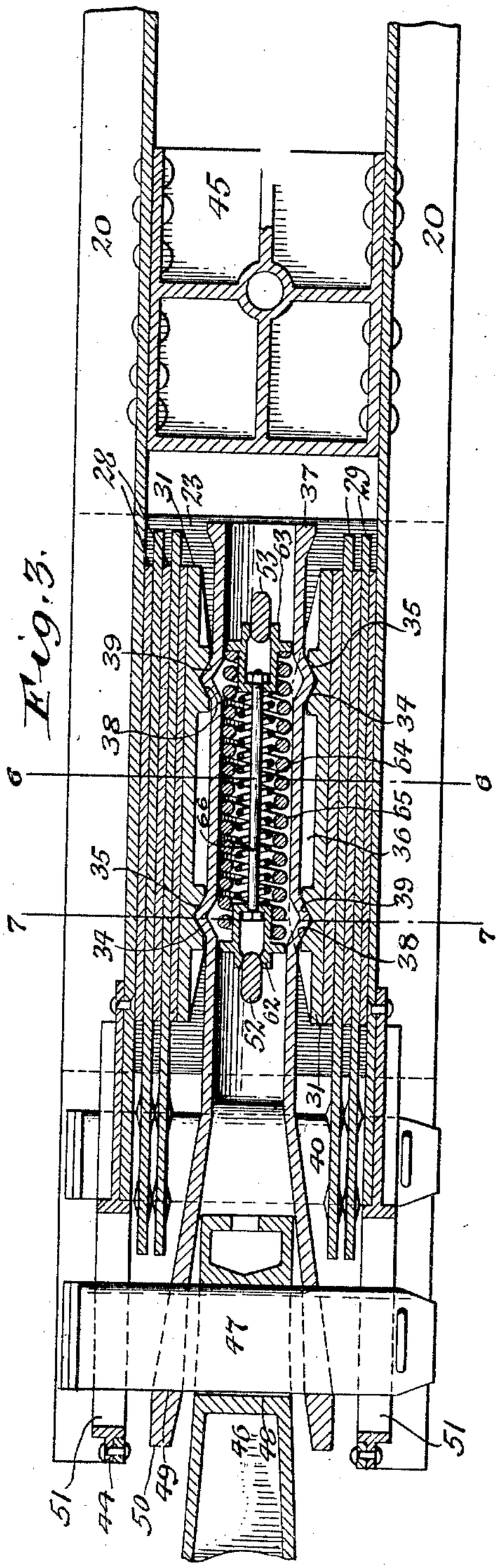

Fig. 3.

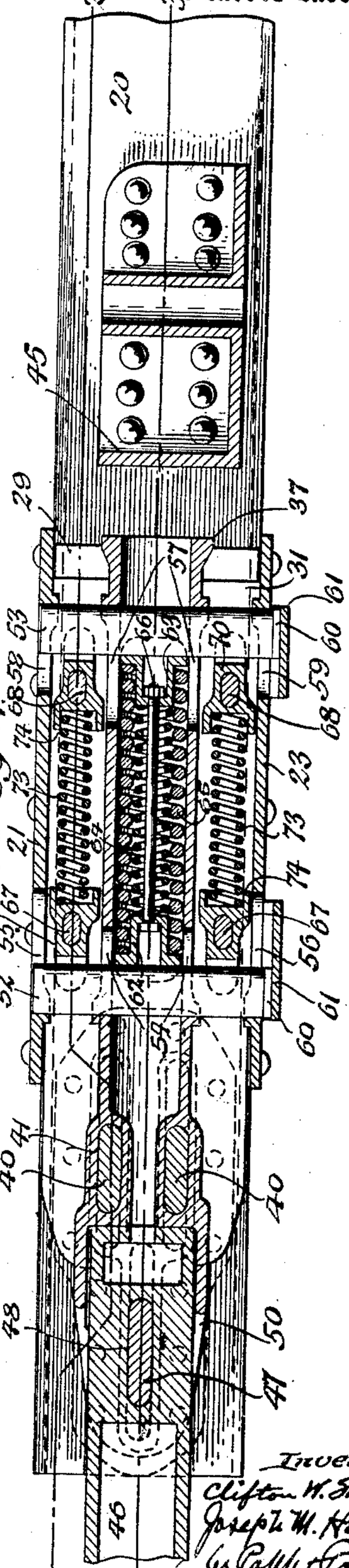

Fig. 4.

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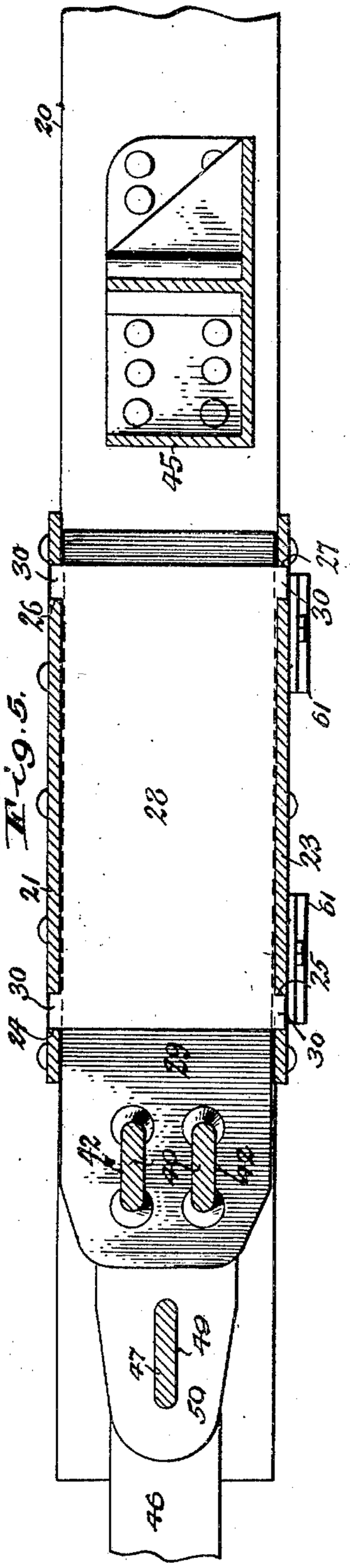
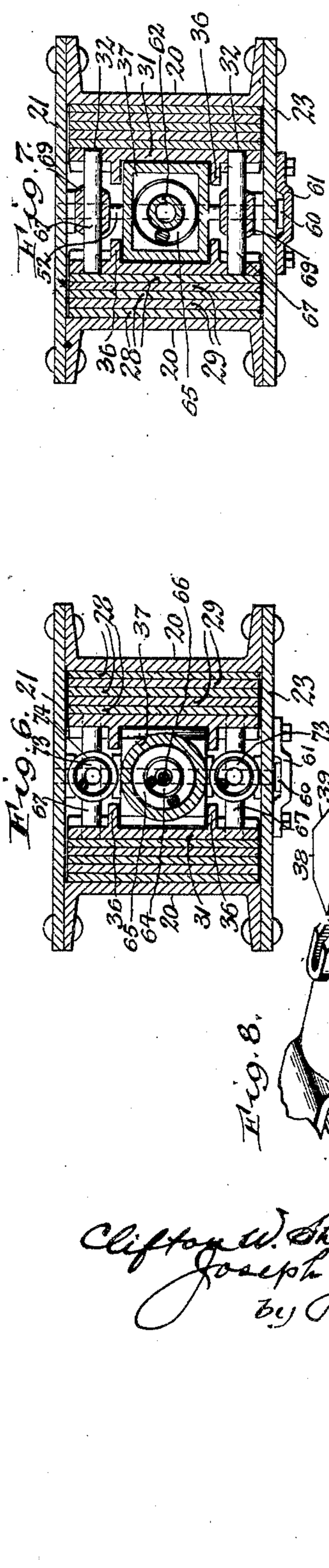
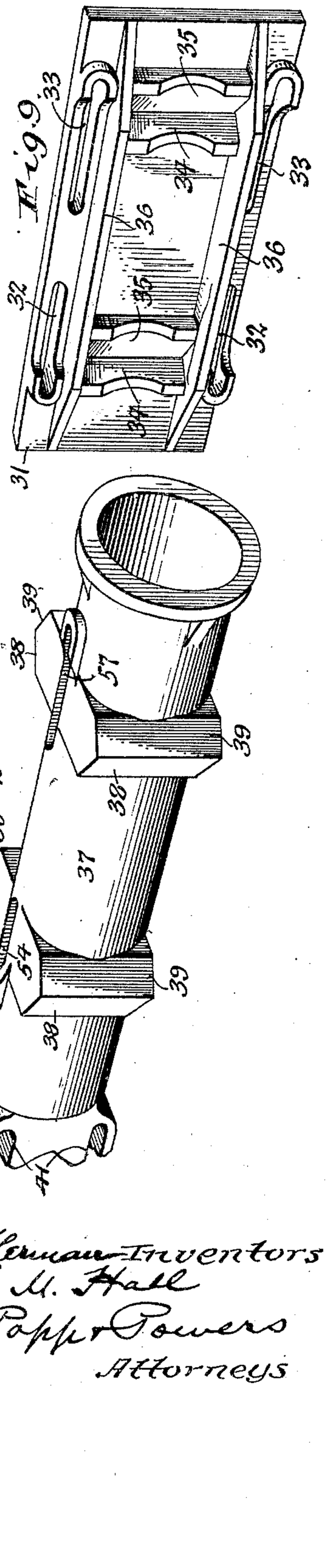
4 Sheets-Sheet 3







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FRICTION DRAFT GEAR

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4 Sheets-Sheet 4

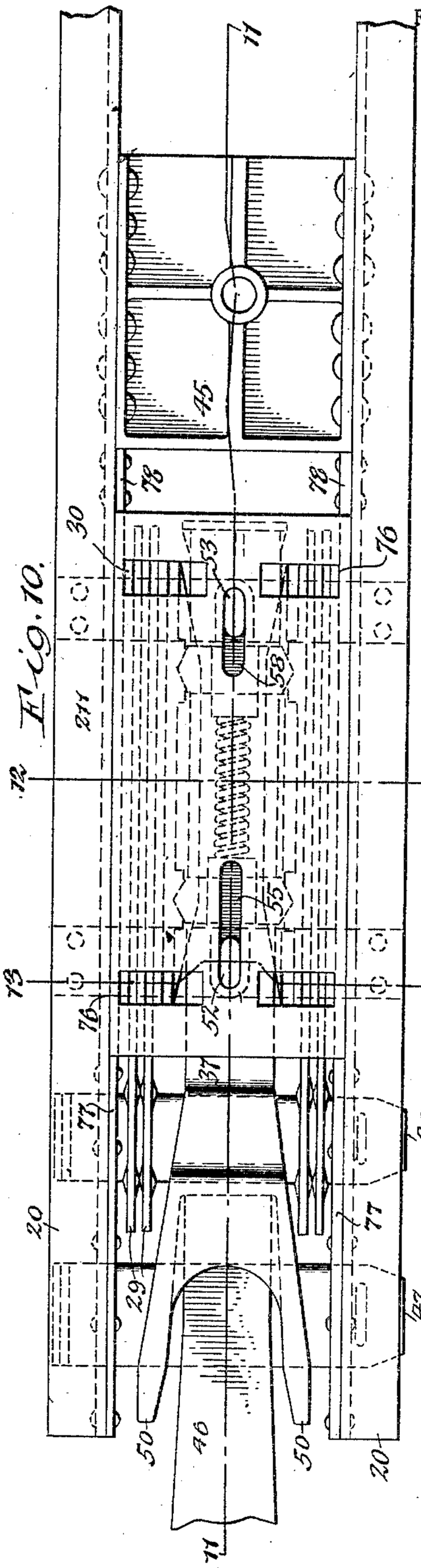

Fig. 10.

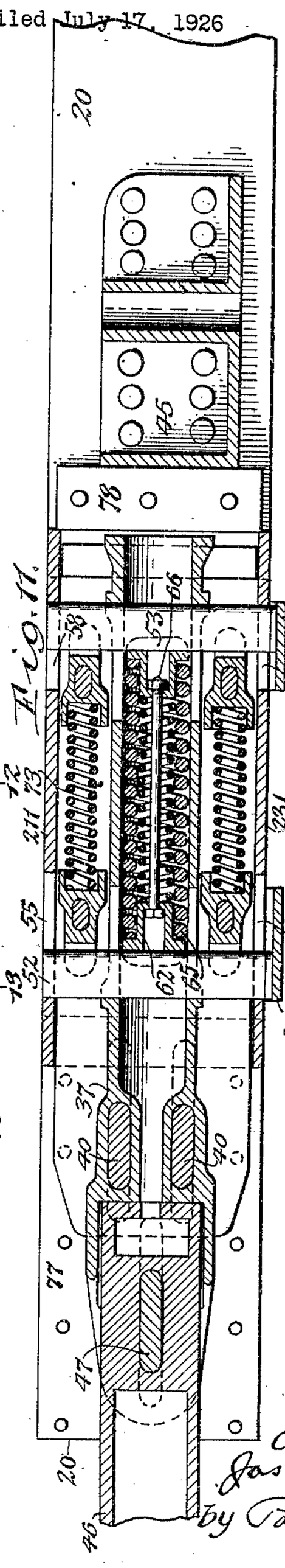

Fig. 11.

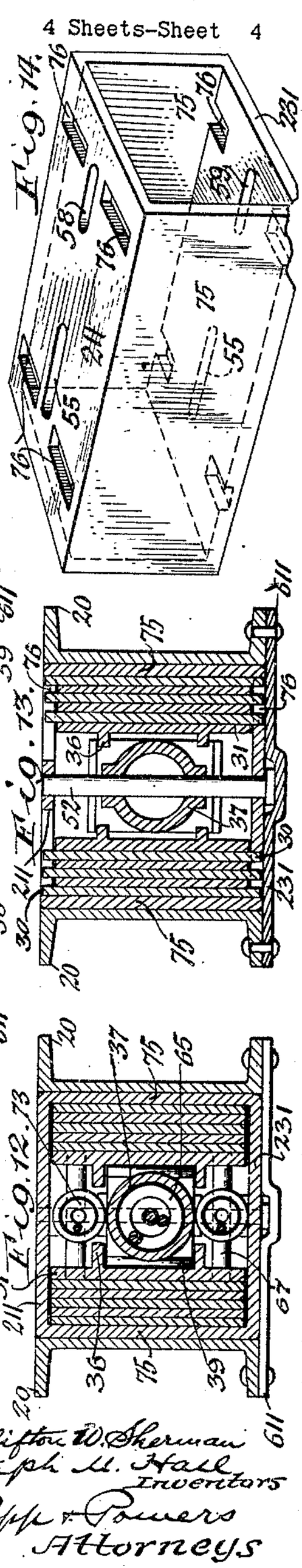

Fig. 14.

Fig. 13.

Fig. 12.

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UNITED STATES PATENT OFFICE.

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FRICTION DRAFT GEAR.

Application filed July 17, 1926. Serial No. 123,100.

This invention relates to that class of shock absorbers for railway cars and other purposes which include in their organization a plurality of sets of intercalated friction plates which are movable lengthwise one relatively to another and which are pressed tightly together during pulling and buffing actions when operating the train so as to add an increased frictional resistance to the spring resistance for cushioning the shock on the cars and the load carried thereby.

One of the objects of this invention is to provide a strong, durable and reliable shock absorber of this type in which some of the friction plates are mounted on the car so as to be held against longitudinal movement relative thereto and other friction plates are connected with the coupler and movable lengthwise relative to the stationary plates.

Another object of this invention is to provide a draft gear in which the buffing and pulling resistances and travels may be varied by using one set of angles or inclines for buffing actions and another set of angles or inclines for pulling actions.

Another object of this invention is to utilize the frictional drag of the movable wedge shoes on adjacent stationary friction plates to set up a wedging pressure instead of obtaining this result by spring action through wedging angles as has been the practice heretofore.

Another object is to utilize the yoke as an oversolid member for limiting the amount of compression which can be imparted to the draft gear when subjected to a buffing action.

Another object of this invention is to so construct the draft gear that separate draft lugs and draft yokes are not required.

A further object of this invention is to provide a friction draft gear which has no wedging action to overcome on release of the gear, and in which the wedging action terminates at the end of a buffing or pulling action of the coupler.

A still further object of this invention is to provide spring means for moving the wedge shoes out of wedging engagement with other members while the gear is releasing and returning to a neutral position.

In the accompanying drawings:—

Figure 1 is a top plan view of a railway draft gear embodying one form of our improved shock absorber. Figures 2 and 3 horizontal sections taken on the correspondingly numbered lines in Figure 4. Figures 4 and 5 are vertical longitudinal sections taken on the correspondingly numbered lines in Figure 1. Figures 6 and 7 are vertical cross sections taken on the correspondingly numbered lines on Figure 3. Figures 8 and 9 are perspective views of the wedge plunger and one of the wedge shoes. Figure 10 is a top plan view of a modified form of my invention. Figure 11 is a vertical longitudinal section of the same taken on line 11—11, Figure 10. Figures 12 and 13 are vertical transverse sections taken on the correspondingly numbered lines in Figure 10. Figure 14 is a perspective view of the hollow friction and anchoring member forming part of the structure shown in Figures 10 and 13.

Similar characters of reference indicate like parts in the several views of the drawings.

Referring to Figures 1–9, the numerals 20 represent the two central longitudinal sills or beams of the car frame which are spaced apart transversely and which are connected on their upper and lower sides adjacent to the outer ends thereof by means of horizontal top and bottom anchor or tie plates 21, 23 which may be connected with the sills by rivets, as shown on the drawings, or in any other suitable manner. The sills form longitudinal walls which are adapted to receive the lateral thrust of the shock absorber.

Adjacent to their front ends the upper and lower tie plates are provided with two sets of anchor slots or openings 24, 25, respectively and adjacent to the rear ends of these plates the same are provided with rear anchoring slots or openings 26, 27, respectively.

In the space between the upper and lower tie plates and the adjacent parts of the sills are two pairs of friction plates which are arranged on transversely opposite sides of the longitudinal center of the draft gear, each pair consisting of a relatively stationary set of plates 28 and a longitudinally movable set of plates 29 intercalated with the stationary

plates. These friction plates are arranged vertically and the stationary plates are held against longitudinal movement but are free to be pressed together with the longitudinally movable plates, this being preferably accomplished by providing the upper and lower edges of the stationary friction plates at opposite ends thereof with anchoring lugs 30, which engage with the anchoring slots 24—27 of the tie plates, these lugs and slots being equal in length but the slots being slightly wider than the lugs to provide the requisite play for permitting the friction plates to be pressed together. The outermost stationary friction plates engage with the inner sides of the sills, as shown in Figures 2, 3, 6 and 7, and the longitudinally movable friction plates extend forwardly and rearwardly beyond the corresponding ends of the stationary friction plates, as shown in Figures 2, 3 and 4.

The numeral 31 represents two wedge shoes engaging with the inner side of the innermost stationary friction plates of both pairs and each provided adjacent to its upper and lower edges with front and rear longitudinal slots 32, 33 and on its inner side with front and rear pairs of inclines, each pair of inclines consisting of a rearwardly facing incline 34 and a forwardly facing incline 35. On its inner side each wedge shoe is provided with guide flanges 36 which are arranged between the inclines 34, 35 and the slots 32, 33, as shown in Figure 9.

Arranged lengthwise between the two wedge plates is a longitudinal thrust member or wedge plunger 37 which is preferably of tubular form and adapted to slide lengthwise with its upper and lower sides in engagement with the upper and lower guide flanges of the wedge shoes. On its opposite sides the wedge plunger is provided with front and rear forwardly facing inclines 38, which are adapted to engage with the rearwardly facing inclines 34 of the wedge shoes, and front and rear rearwardly facing inclines 39 which are adapted to engage with the forwardly facing inclines 35 of the wedge shoes. Near its front end this wedge plunger is connected with the longitudinally movable friction plates by two horizontal superposed friction plate keys 40, each passing transversely through an opening 41 in the wedge plunger and openings 42 in the front ends of the longitudinally movable friction plates and slidable lengthwise at its opposite ends in slots 43 formed in cheek plates 44 secured to the sills and practically forming a part thereof. The rear end of the wedge yoke block is normally spaced from a transverse stop block or bolster 45 secured between the inner parts of the sills but is adapted to engage therewith and render the draft solid when the wedge plunger has moved backwardly a predetermined extent and thereby prevent oversolid action on the shock absorbing mechanism. At its front end the wedge plunger is engaged by the rear end of the butt or shank 46 of the coupler and these members are connected by a coupler key 47 passing through corresponding openings 48, 49 in the coupler shank and coupling lugs 50 which project forwardly from the wedge plunger on opposite sides of the shank, and the opposite ends of the coupler key are slidable lengthwise in longitudinal slots 51 formed in the adjacent parts of the cheek plates 44 of the sills.

The numerals 52, 53 represent front and rear thrust or draft keys which are arranged vertically, the front key 52 passing through front longitudinal slots 54 in the wedge plunger and comparatively long front slots 55, 56 in the upper and lower tie plates, and the rear key 53 passing through rear longitudinal slots 57 in the wedge plunger and comparatively short rear slots 58, 59, in said tie plates, respectively. These thrust keys are inserted at their respective slots from the under side of the draft gear and are provided at their lower ends with heads 60 adapted to engage with the under side of the lower tie plate and are held in their operative position by retaining plates 61 engaging with the lower ends of the thrust keys and secured to the under side of the lower tie plate. The central parts of the opposing edges of the front and rear thrust keys are engaged by front and rear releasing spring seats 62, 63 arranged within the wedge yoke, each of which is fork shaped and straddles the respective thrust key, as shown in Figures 3 and 4. The two thrust keys are yieldingly held apart so that the front key engages the front ends of the front key slots in the tie plates 21, 23 and the rear thrust key engage the rear ends of the rear key slots in the tie plates, this being accomplished by releasing spring means consisting preferably of two helical springs 64, 65 arranged one within the other and placed within the central part of the wedge plunger so as to bear at their front and rear ends against said releasing spring seats 62, 63. The latter are connected by a central tie bolt 66 so that the releasing springs may be placed under an initial tension for convenience in assembling and dismembering the parts.

Above and below the wedge plunger the two wedge shoes are operated on by a pair of front shoe operating bars 67, and a pair of rear shoe operating bars 68. These shoe operating bars are arranged horizontally and transversely and pass with their central parts through positioning spring seats 69, 70, which have their outer ends constructed in the form of forks 71 which embrace the inner sides of the front and rear key bars 67, 68, respectively. The front key bars 67 have their op-

posite ends arranged in the comparatively short longitudinal slots 32 in the front parts of the wedge shoe and the rear keys 68 have their opposite ends arranged in the comparatively long longitudinal slots 33 on the rear parts of the wedge shoes. Above and below the wedge plunger are arranged two longitudinal positioning springs 73 each of which engages its opposite ends in sockets 74, 74, formed on the opposing sides of the positioning spring seats on the corresponding side of the wedge plunger.

The operation of this mechanism is as follows:—

In the release or neutral position of the draft gear the releasing and positioning springs are fully expanded, the front and rear thrust keys engage, respectively, with the rearwardly facing shoulders formed by the front ends of the front thrust key slots and the forwardly facing shoulders formed by the rear ends of the rear thrust key slots, as shown in Figures 1 and 4, the front and rear shoe operating bars engage, respectively, with the rearwardly facing shoulders formed by the front ends of the front slots in the shoes and the forwardly facing shoulders formed by the rear ends of the rear slots in the same, as shown in Figure 2, the front and rear positioning spring seats are spaced from the front and rear thrust keys, as shown in Figures 2 and 4 and the forwardly and rearwardly facing inclines of the wedge yoke do not exert any wedging action against the rearwardly and forwardly facing inclines of the wedge shoes so that the friction plates at this time engage each other with a predetermined minimum amount of friction.

Upon subjecting the draft gear to a buffing load this will cause a backward movement of the coupler, wedge plunger, longitudinally movable friction plates and front thrust key, and at this time the rear thrust key is at rest and engages with the forwardly facing shoulder formed by the rear end of the thrust slots in the tie plates. During the first part of this movement the main or releasing spring is put under additional compression but the wedge shoes due to the drag of the same on the innermost stationary plates are frictionally held against movement out of the neutral position, whereby the rearwardly facing inclines of the plunger exert a wedging action against the forwardly facing inclines of the shoes and cause the latter to be pressed laterally outward and produce a strong frictional engagement between the relatively stationary and longitudinally movable friction plates.

After this initial inward movement of the plunger has been effected the front thrust key engages with the front positioning spring seats and pushes the same rearwardly thereby tending to compress the positioning springs. At this time the wedge shoes may slip rearwardly slightly under the pressure transmitted to the same by the wedge action of the wedge plunger and the rearward movement of the wedge shoe operating bars which latter are subjected to the rearward pressure of the positioning springs. The rearward movement of the wedge shoes is, however, arrested when the rear positioning spring seats engage with the rear thrust key so that henceforth the positioning springs are unable to effect any further backward movement of the shoes, and the latter are now subjected only to the wedging action of the rearward facing inclines of the plunger against the forwardly facing inclines of the shoes, whereby the stationary and longitudinally movable friction plates are pressed together with increased pressure and a greater frictional resistance is opposed to the rearward movement of the coupler and associated parts. The movable friction plates can move rearwardly in this manner but against gradually increasing frictional resistance due to the increasing wedge action of the plunger against the shoes and the increased tightness of the pressure of the friction plates against each other, thereby gradually absorbing the shock of the load until the plunger engages the rear stop or bolster, at which time the draft gear is solid and the maximum cushioning capacity of the gear has been reached.

When the rearward pressure of the plunger ceases the lateral wedging pressure of the same against the shoes is arrested and the pressure of the friction plates against each other is reduced, thereby releasing the gear and permitting the shoes to be moved forwardly with the plunger and the movable friction plates, to the neutral or normal position.

This return movement of the shoes is effected by the expansion of the positioning springs which move the front shoe operating bars forwardly into engagement with the rearwardly facing shoulders formed by the front ends of the front slots in the shoes, until the positioning springs reach the limit of their expansion and the shoes are substantially in their central or neutral position.

Upon subjecting the draft gear to a pulling load the action is the same as that described with reference to subjecting the draft gear to a buffing load, with the exception that the forwardly facing inclines of the plunger engage the rearwardly facing inclines of the shoes and the gear reaches its solid condition and exhausts its cushioning when the coupler key engages the front ends or shoulders of the companion slots in the cheek plates of the sills, it being understood that at this time the front thrust key and shoe operating bars are stationary and the rear thrust key and shoe operating bars move forwardly toward the front thrust key and shoe operating bars. The release of the gear and the return of the

parts to normal, central or neutral position is also effected after a pulling action in a manner similar to that following a buffing action, it being understood that at this time the rear thrust key and shoe operating bars move rearwardly from the relatively stationary front thrust key and shoe operating bars, and the shoes are dragged backwardly to their normal central position.

In this construction, it is possible to vary the extent of movement of the draft gear during pulling and buffing actions to suit different conditions. For example in the present case the front slots in the tie plates for the front thrust key are made comparatively long and the rear slots in the same which receive the rear thrust key are made comparatively short, and the front slots in the shoes for the front shoe operating bars are made comparatively short while the rear slots in the same for the rear shoe operating bars are made comparatively long, which formation permits of a comparatively long buffing stroke, say four inches, and a comparatively short pulling stroke, say two inches.

From the foregoing it will be evident that the draft gear is very light in weight in proportion to its shock absorbing capacity.

Moreover, this draft gear permits of using friction plates and shoes having a much greater area than was possible heretofore, thereby increasing the frictional resistance capacity without undue wear on the parts and also furnishing the required resistance for setting up action without relying on the resistance of springs for this purpose.

In the construction shown in Figures 10–14, the upper and lower anchor plates 211 and 231 are not connected with the sills but instead are connected at their corresponding longitudinal edges by vertical longitudinal thrust walls 75, 75 which, together with the upper and lower plates, forms a box-like anchoring member. This member is arranged between the car sills so that the side walls thereof are interposed between the outermost stationary friction plates and the inner sides of the sills and the lateral pressure against the friction plates, due to the wedge action between the shoes and the plunger, is taken up by the anchoring member instead of being transmitted to the sills. This anchoring member is supported on its under side by transverse retaining plates 611 secured to the lower sides of the sills and also serves to hold the adjacent thrust keys in place.

As shown in Figures 10 and 14, adjacent groups of anchoring lugs on the stationary friction plates may be engaged with a single anchoring opening 76 in the anchoring plates instead of providing an individual anchoring opening for each stationary friction plate, as shown in Figure 1. Longitudinal movement of the anchoring member is prevented by engaging the front end of this member with the cheek plates 77 secured to the inner side of the sills and engaging the rear end of the anchoring member with stop plates or lugs 78 secured to the inner sides of the sills.

The method of operation of the shock absorber shown in Figures 10–14 and the advantages derived therefrom are the same as those set forth previously with reference to the structure shown in Figures 1–9.

We claim as our invention:—

1. A friction draft gear comprising intercalated friction plates some of said plates being relatively stationary and others being movable lengthwise of the stationary plates, and means for pressing said plates tightly together during a compression stroke and releasing the pressure during the return of the parts to normal position, including shoes engaging said plates, a plunger movable lengthwise of said shoes, and forwardly and rearwardly facing inclines arranged on said plunger and engaging with correspondingly facing inclines on said shoes.

2. A friction draft gear comprising longitudinal thrust walls adapted to receive transverse pressure, a plurality of relatively stationary friction plates arranged between said thrust walls, a plurality of longitudinally movable friction plates intercalated with said stationary friction plates, wedge shoes bearing against the innermost stationary friction plates and provided with forwardly and rearwardly facing inclines, and a wedge plunger arranged between said wedge shoes and having rearwardly and forwardly facing inclines adapted to engage respectively with the forwardly and rearwardly facing inclines of said shoes.

3. A friction draft gear comprising a plurality of relatively stationary friction plates, a plurality of longitudinally movable friction plates intercalated with said stationary plates, wedge shoes engaging with said stationary plates and provided with forwardly and rearwardly facing inclines which are independent of each other, and a longitudinally movable thrust member having rearwardly and forwardly facing inclines which are adapted to engage, respectively, with said forwardly and rearwardly facing inclines on said shoes upon moving said thrust member lengthwise in one direction or the other.

4. A friction draft gear comprising a plurality of intercalated friction plates which are movable lengthwise one relatively to another, means for creating lateral pressure between said plates including a longitudinally movable thrust member, and means for arresting the longitudinal movement of said thrust member, and extreme buffing action consisting of a back stop which is adapted to be engaged by said thrust member while the movable

friction plates do not engage said back stop.

5. A friction draft gear comprising longitudinal thrust walls, relatively stationary friction plates arranged between said thrust walls, longitudinally movable friction plates intercalated with said stationary friction plates, anchor plates provided with rearwardly and forwardly facing shoulders, wedge shoes engaging the innermost stationary friction plates and each provided with rearwardly and forwardly facing shoulders and with rearwardly and forwardly facing inclines, a wedge plunger arranged between said shoes and having forwardly and rearwardly facing inclines adapted to engage with the rearwardly and forwardly facing inclines on said shoes, said plunger being also provided with a rearwardly facing shoulder and a forwardly facing shoulder, front and rear thrust keys engaging respectively with said rearwardly and forwardly facing shoulders of said anchor plates and plunger, a spring resistance interposed between said thrust keys, front and rear shoe operating bars engaging their opposite ends with the rearwardly and forwardly facing shoulders, respectively, of said shoes, and spring means interposed between said front and rear shoe operating bars.

6. A friction draft gear comprising longitudinal thrust walls, relatively stationary friction plates arranged between said thrust walls, longitudinally movable friction plates intercalated with said stationary friction plates, anchor plates provided with rearwardly and forwardly facing shoulders, wedge shoes engaging the innermost stationary friction plates and each provided with rearwardly and forwardly facing shoulders and with rearwardly and forwardly facing inclines, a wedge plunger arranged between said shoes and having forwardly and rearwardly facing inclines adapted to engage with the rearwardly and forwardly facing inclines on said shoes, said plunger being also provided with a rearwardly facing shoulder and a forwardly facing shoulder, front and rear thrust keys engaging respectively with said rearwardly and forwardly facing shoulders of said anchor plates and plunger, a spring resistance interposed between said thrust keys, front and rear shoe operating bars engaging their opposite ends with the rearwardly and forwardly facing shoulders, respectively, of said shoes, spring seats mounted on said shoe operating bars and embracing said thrust keys, respectively, and spring means interposed between said spring seats.

7. A friction draft gear comprising longitudinal thrust walls, anchoring members connected with said thrust walls, relatively stationary friction plates arranged between said walls, longitudinally movable friction plates intercalated with said stationary friction plates, wedge shoes engaging with the inner sides of the innermost stationary friction plates and provided with rearwardly and forwardly facing inclines, a hollow longitudinally movable thrust plunger arranged between said shoes and having forwardly and rearwardly facing inclines which are adapted to engage respectively with the rearwardly and forwardly facing inclines of said shoes, thrust keys passing through said thrust plunger and having limited sliding engagement with the same and with said anchoring members, releasing spring means arranged within said plunger and interposed between said keys, front and rear shoe operating bars arranged outside of said plunger and having limited sliding engagement with said shoes and with said keys, and spring means interposed between said front and rear shoe operating bars.

8. A friction draft gear comprising longitudinal thrust walls, anchoring members connected with said thrust walls, relatively stationary friction plates arranged between said walls, longitudinally movable friction plates intercalated with said stationary friction plates, wedge shoes engaging with the inner sides of the innermost stationary friction plates and provided with rearwardly and forwardly facing inclines, a hollow longitudinally movable thrust plunger arranged between said shoes and having forwardly and rearwardly facing inclines which are adapted to engage respectively with the rearwardly and forwardly facing inclines of said shoes, thrust keys passing through said thrust plunger and having limited sliding engagement with the same and with said anchoring members, releasing spring means arranged within said plunger, and interposed between said keys, front and rear shoe operating bars arranged outside of said plunger and having limited sliding engagement with said shoes and with said keys, spring means interposed between said front and rear shoe operating bars, and means for connecting the plunger with said movable plates.

9. A friction draft gear comprising longitudinal thrust walls, anchoring members connected with said thrust walls, relatively stationary friction plates arranged between said walls, longitudinally movable friction plates intercalated with said stationary friction plates, wedge shoes engaging with the inner sides of the innermost stationary friction plates and provided with rearwardly and forwardly facing inclines, a hollow longitudinally movable thrust plunger arranged between said shoes and having forwardly and rearwardly facing inclines which are adapted to engage respectively with the rearwardly and forwardly facing inclines of said shoes, thrust keys passing through said thrust plunger and having limited sliding engagement with the same and with said anchoring members, releasing spring means arranged

within said plunger, and interposed between said keys, front and rear shoe operating bars arranged outside of said plunger and having limited sliding engagement with said shoes and with said keys, spring means interposed between said front and rear shoe operating bars, a key connecting the front ends of the movable friction plates with the adjacent part of said plunger, and a coupler engaging with the front end of said plunger and connected therewith.

In testimony whereof we hereby affix our signatures.

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JOSEPH M. HALL.