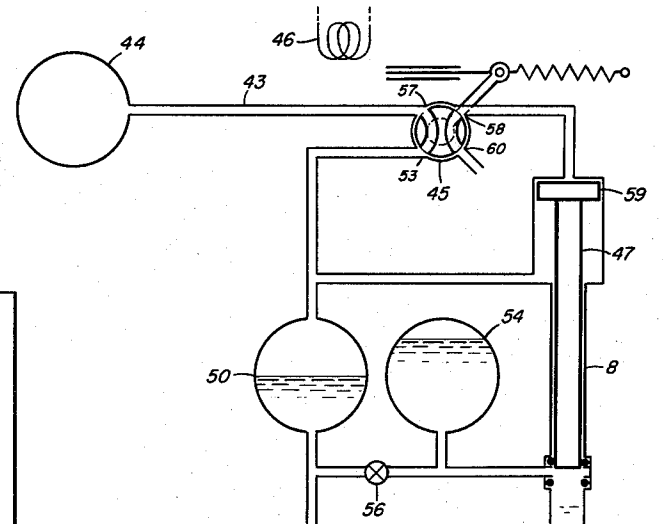
April 12, 1966 G. W. COPE 3,245,553

FLUID-OPERATED UNCOUPLING MECHANISM

Filed March 24, 1965 2 Sheets-Sheet 1

FIG. 2



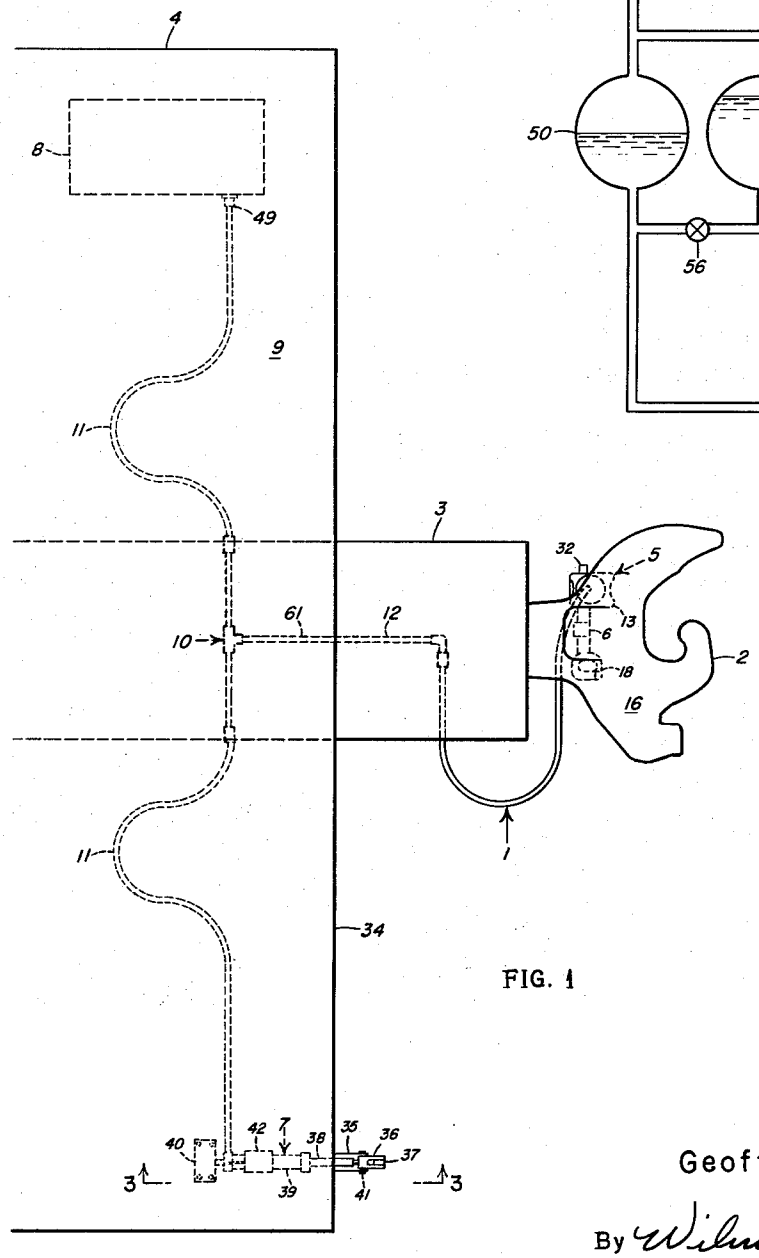


FIG. 1

Inventor:
Geoffrey W. Cope

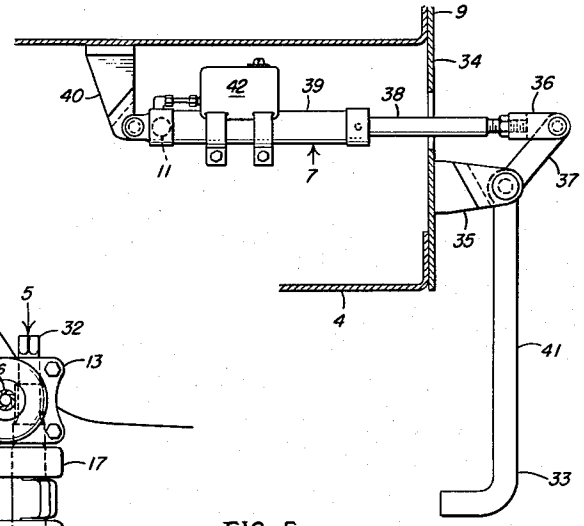
By Wilmer Mechlin
his Attorney

April 12, 1966 G. W. COPE 3,245,553

FLUID-OPERATED UNCOUPLING MECHANISM

Filed March 24, 1965 2 Sheets-Sheet 2

FIG. 3



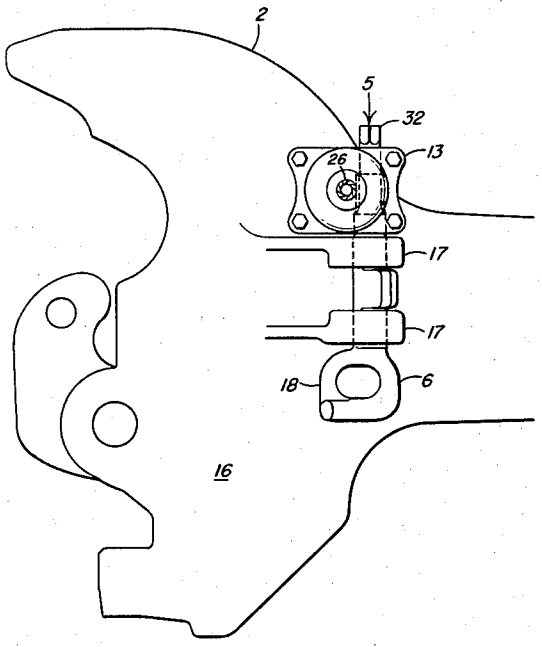


FIG. 5

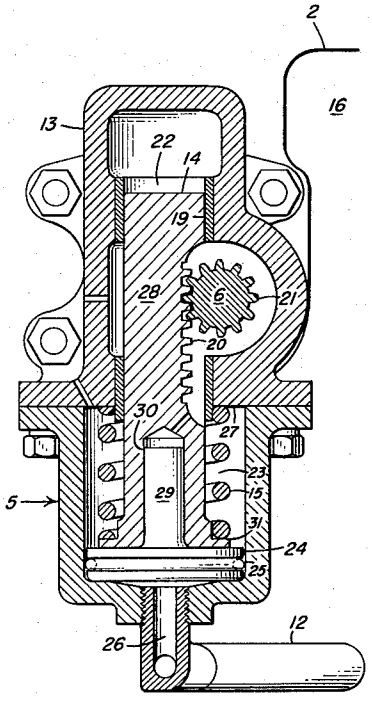


FIG. 6

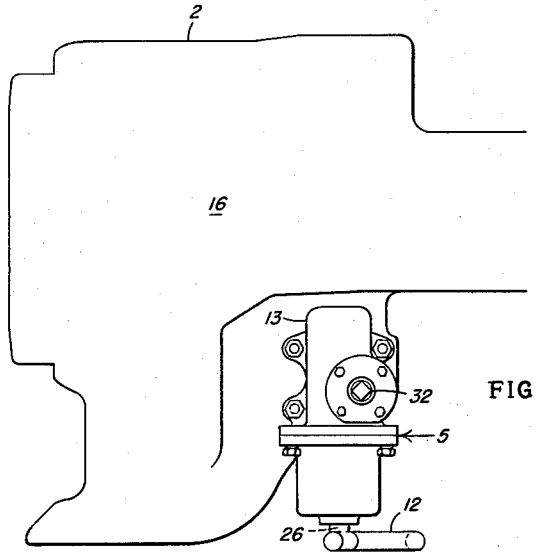


FIG. 4

Inventor:
Geoffrey W. Cope

By Wilmer Mechlin

his Attorney

United States Patent Office

3,245,553

Patented Apr. 12, 1966

3,245,553

FLUID-OPERATED UNCOUPLING MECHANISM

Geoffrey W. Cope, Williamsville, N.Y., assignor to Symington Wayne Corporation, Salisbury, Md., a corporation of Maryland

Filed Mar. 24, 1965, Ser. No. 442,423

18 Claims. (Cl. 213—212)

This invention relates to uncoupling mechanisms for railway car couplers and has for its primary object the provision of an improved fluid-operated uncoupling mechanism which is adapted for either manual or automatic operation.

Another object of the invention is to provide a fluid-operated uncoupling mechanism which can be applied with equal facility to the couplers of ordinary freight cars and to accommodate the wide lateral swing and extended longitudinal movement required of the couplers of long overhang cars equipped with cushioned underframes.

An additional object of the invention is to provide a fluid-operated unlocking mechanism which is unaffected in its operation by the position of a coupler relative to a car.

A further object of the invention is to provide a fluid-operated uncoupling mechanism which can be applied with a minimum of change to a standard knuckle type coupler and, when so applied, not only is unaffected by end and vertical shocks but also will positively lock the coupler against unlocking in case of failure of its anti-creep means under such shocks.

Another object of the invention is to provide a fluid-operated unlocking mechanism for a knuckle type coupler which, even in case of a fluid pressure failure, will still positively lock the coupler against unlocking and permits direct mechanical unlocking.

A further object of the invention is to provide a liquid-operated uncoupling mechanism which requires no operating slack, can be operated either manually from a side of a car in the manner of a conventional operating rod or automatically, and is readily adapted for selective operation in either way.

Other objects and advantages of the invention will appear hereinafter in detailed description, be particularly pointed out in the appended claims and be illustrated in the accompanying drawings in which:

FIGURE 1 is a plan, in part schematic, view of a preferred embodiment of the improved fluid-operated uncoupling mechanism of the present invention;

FIGURE 2 is a diagram of a pressure intensifier powered by compressed air and suitable for automatic operation of the improved mechanism when a liquid is used as the operating medium;

FIGURE 3 is a fragmentary vertical sectional view on an enlarged scale, taken along lines 3—3 of FIGURE 1;

FIGURE 4 is a fragmentary side elevational view on the scale of FIGURE 3, of the part of the coupler shown in FIGURE 1 with a portion of the fluid line to the actuator removed;

FIGURE 5 is a bottom plan view of the structure of FIGURE 4 with a further portion of the fluid line removed; and

FIGURE 6 is a fragmentary vertical sectional view on a further enlarged scale, taken through the center of the actuator parallel to the plane of FIGURE 4.

Referring now in detail to the drawings in which like reference characters designate like parts, the improved fluid-operated uncoupling mechanism of the present invention is applicable generally to automatic couplers, which are so-termed because they lock automatically in coupling, but probably will find its principal uses on long cars, cushion underframe cars and in adapting freight car couplers for selective automatic or manual operation. As exemplary of the invention, the improved mechanism, designated as 1, therefore has been applied to a type "F" coupler 2, typical of the now standard knuckle type freight car couplers. To illustrate the extreme versatility of the improved mechanism, the coupler 2 is mounted in a draft arm 3, suitably in the manner shown in my copending application Serial No. 302,668, filed on August 16, 1963, now Patent No. 3,211,297, issued October 12, 1965, for providing the wide lateral swing required in a long overhang car 4 equipped with a cushion underframe (not shown).

Although fluid-operable in the broad sense of being capable of operation by either a gas or a liquid under pressure, the improved mechanism 1 far preferably is liquid-operated, particularly if there is to be provision for hand operation, to eliminate the slack in operation or action inherent in the compressibility of a gaseous operating medium. Structurally, the uncoupling mechanism 1 is comprised of a fluid-operated lock actuator 5 mounted on the coupler 2 and drivably and preferably mechanically connected to the lock (not shown) of the particular coupler through a rotor 6 or other element in the lock lift or release train, assembly or means (not otherwise shown). Fluid under pressure for operating or actuating the actuator 5 to unlock the coupler 2, is supplied to it by one or more operating devices, of which there preferably are two, one, 7, manually operated and the other, 8, automatically operated. Mounted at suitable locations on the car 4 below the car's body 9, the preferred manual and automatic operating devices 7 and 8, respectively, are fluid-connected to the actuator 5 by supply piping or tubing 10, which in part at least is flexible and preferably armored to accommodate the movements of the coupler 2 relative to the car body without risk of breakage. The illustrated supply piping 10 has two branches or branch lines 11, each leading to one of the operating devices 7 and 8 and both T'd or otherwise suitably connected to a common lead line 12 to the actuator 5.

Although its exact form will depend upon the lock lift or release means of the particular coupler to which it is applied, the lock actuator 5 in any case will have a housing or casing 13 in which a plunger or slide 14 is slideably or reciprocably mounted for movement in a direction to unlock the coupler 2 in response to the application of fluid pressure to the actuator 5 by one or another of the operating devices 7 and 8. This movement of the plunger 14 in response to an application of fluid pressure, desirably is against the yieldable resistance or force of a coil or other suitable return spring 15 to ensure that the plunger will return to initial or normal position at the conclusion of an unlocking operation. By a suitable driving connection between the plunger 14 and the lock release means of the particular coupler, the advance stroke of the plunger, in response to applied fluid pressure, is translated or converted into the rotary or other movement required to unlock the coupler.

Releasably mounted on the coupler 2, most conveniently on its head 16, the lock actuator 5, when applied to a bottom-operated coupler. such as the illustrated type "F," readily can be mounted on the underside of the head at an outer side of one of the pair of depending ears or lugs 17 in which the rotor 6 is journalled. Drivably connected or linked between the ears 17 to the balance (not shown) of a conventional lock lift assembly or release train of which it is a part, the rotor 6 has at one end the usual eye 18 and at the other projects or extends into and preferably through the housing 13 at a side of and at right angles or normal to the plunger 14. Preferably sliding in and guided by a fixed cylindrical liner 19 of lubricious, wear-resistant material, such as "Teflon," the plunger 14 has formed on its side facing the confront-

ing end of the rotor 6 a rack 20 drivably engaging a pinion 21 formed on the rotor.

The slide bore 22 for the plunger 14 in the liner or sleeve 19 opens at one end, here downwardly, into a preferably cylindrical chamber of larger cross-section in which rides or slides the plunger's enlarged head 24. Suitably fitted with an O-ring for sealing engagement with the side of the chamber 23, the head 24 is adapted to have fluid pressure from the supply piping 10 applied to its outer end through an inlet port 26 in the housing 13 which opens inwardly onto the outer or lower end of the chamber. Also contained in the chamber 23 about the plunger 14 is the preferred coil return spring 15, which, by acting between the inner end of the head 24 and an opposed confronting wall or abutment 27 bounding or defining the opposite end of the chamber, yieldably opposes the advance movement of the plunger under force of the applied fluid pressure. Instead of being made in one piece, the body or shank 28 of the plunger 14 carrying the rack 20 and the head 24, preferably are formed separately and suitably connected for axial movement both in unison and relatively, as by providing or forming on the inner end of the head an axial pin 29 instanding into and slideably received or fitting in an axial socket 30 in the confronting or adjoining outer end of the body.

With the return force of the spring 15 applied to the plunger 14 through a radially outstanding annular flange or skirt 31 on and about the outer end of the body 28, rather than directly through the head 24, it is possible to mechanically unlock the coupler 2 directly by hand in case of a breakdown in the fluid-operated uncoupling mechanism 1, either by insertion of the usual operating rod (not shown) in the eye 18 at one end of the rotor 6 or by application of a suitable turning tool (not shown) to the square or like operating head 32 formed for that purpose on the opposite end of the rotor beyond the housing 13. Conversely, the return spring 15, by normally holding the plunger 14 and therethrough the rotor 6 in a position in which the coupler 2 is locked, provides, by the rack-and-pinion driving connection between the plunger and the rotor, a lock that, while yieldable to permit automatic coupling, is positive against accidental unlocking or uncoupling of the coupler, even under vertical or end shocks so severe as to cause its in-built anti-creep means to fail.

Although it unlocks the coupler 2 by fluid pressure, rather than mechanically, the preferred manual operating device 7, in the manner in which it is operated, is designed to simulate closely the operation of the usual lock operating rod in mechanically unlocking a coupler, to eliminate the need for special training in its use. The preferred device 7 is a hand pump having a handle 33 which is pivotally mounted on the end 34 of the car 4 adjacent a side and in substantially the location of the handle of the usual lock operating rod. Pivotally mounted on a mounting bracket 35 fixed to the end 34, the handle 33 preferably is formed as an outwardly bent bell crank for obtaining the required length of throw with a minimum projection of the bracket. Threadedly connected for adjustment to a pivoted link 36 on the upper arm 37 of the handle 33, the pump rod 38 extends substantially horizontally through the end 34 of the car body into the pump's barrel 39, the inner end of which is pivotally mounted on the second mounting bracket 40, depending from the underside of the car body 9. Were air or other compressed gas used as the fluid in the uncoupling mechanism 1, the pump 7 would have to be pumped repeatedly to produce the movement of the plunger 14 in the actuator 5 required to unlock the coupler 2. However, in the preferred mechanism in which the operating fluid is oil or other suitable liquid, so long as the piping 10 is completely filled with the liquid, a single stroke of the pump 7, on upward swinging of the lower arm 41 of the vertically swinging handle 33, can be made to unlock the coupler 2 simply by making the amount of liquid displaced from the barrel 39 by that stroke equal to the amount required to fill the chamber 23 in the housing 13 of the actuator 5 to the point where the plunger 14 has completed its advance stroke. Conversely, on release of the handle 33 at the end of an uncoupling operation, the pump rod 38 will be pushed out to return the handle to normal position by displacement of liquid from the chamber 23 to the barrel 39 under force of the return spring 15. In the preferred liquid-operated mechanism 1, a liquid supply tank or reservoir 42 mounted at some convenient place, such as on the barrel 39, replenishes any minor losses in the system.

While disadvantages in manual operation because of the repeated pumpings of the hand pump 7 required to advance the plunger 14 sufficiently to unlock the coupler 2, a compressed gas in the form of compressed air at substantially full reservoir pressure, is available in the main air line of a car so long as the car is connected to a locomotive having its compressor operating. Given a sufficient area against which to work on the head 24 of the plunger 14, a steady application of compressed air at main line pressure will operate the actuator 5. For such compressed air operation, the automatic operating device 8 thus may simply be a solenoid-actuated or other suitable remotely operable control valve connected to the main air line for automatically controlling the application of compressed air at reservoir pressure to the actuator 5. However, the nuisance of compressed air in manual operation of the mechanism 1 and the desirability of such operation for unlocking a coupler of a car when a source of compressed air is not readily available, dictate the preferred use of oil or other suitable liquid as the operating fluid. In keeping, the preferred automatic operating device 8 is a device for applying a liquid, usually oil, under pressure to the actuator 5. Rather than use a suitable electrically driven pump to supply the pressure, it is preferred to depend for the driving force or power upon compressed air drawn from a car's main air line and convert that force into oil under pressure, in process intensfying or boosting the force.

An intensifier or booster of the single pressure type, suitable for use as the automatic operating device 8 in liquid or hydraulic operation of the uncoupling mechanism 1, is shown diagrammatically in FIGURE 2. Receiving air at substantially train line pressure through a connecting line 43 from a compressed air source 44, which usually will be a car's main air line, the automatic operating device or intensifier 8 is controlled in its operation by a four-way air valve 45, which is actuable by suitable means, such as a solenoid 46, for automatic operation of the intensifier from a remote control point. The intensifier 8 has in tandem, or series a ram 47 for converting compressed air applied to it into oil under pressure and a piston 48 against which oil is driven by the ram, for intensifying or boosting the oil pressure applied to it in displacing oil through an outlet 49 into the related or adjoining branch 11 of the supply piping 10. The intensifier 8 has two oil tanks, one, 50, connected on its oil side to the cylinder 51 of the piston 48 below or beyond the piston's head 52 and on its air side to a return air outlet or outlet port 53 of the control valve 45. The other oil tank 54, when the ram is in retracted position, is connected to the passage 55 between the ram 47 and the piston 48. Disconnected by an intervening shutoff valve 56, except when adjusting their oil levels, the tanks 50 and 53 serve as make-up or supply tanks for replenishing the oil as needed in the cylinder 51 and passage 55.

In FIGURE 2 the intensifier 8 is shown in its normal, inactive or inoperative position or condition in which the solenoid 46 is de-energized and the control valve 45 has its inlet or inlet port 57 connected to its return air outlet or outlet port 53. The advance or power air outlet or outlet port 58 of the valve leading to the top of the head 59 of the ram 47, in turn is connected to the valve's

atmospheric exhaust or exhaust port 60. In this condition, the ram 47 and piston 48 are held in retracted positions by the pressures respectively of air and oil against the bottoms of their heads 59 and 52.

To unlock the coupler 2, the solenoid 46 is energized to turn the valve 45 to a position in which its inlet port 57 is connected to its advance air outlet port 58 and its return outlet port 53 is connected to its exhaust port 60. On the valve 45 reaching this position, compressed air is applied to the top of the head 59 of the ram 47 and powers the advance or power stroke of the ram. In the course of that stroke, the ram 47 at the outset isolates the tank 54 from the passage 55 and then displaces oil from the passage into the cylinder 51 against the top of the head 52 of the piston 48. So powered, the piston 48 displaces oil under high pressure relative to the initial air pressure, through the supply piping 10 into the chamber 23 of the actuator 5, which advances the plunger 14 and unlocks the coupler 2. Subsequent de-energizing of the solenoid 46 enables the compressed air from the source 44 to apply, directly and through the tank 50, the force required to return the ram 47 and piston 48 to initial or normal position. As they do so, the return spring 15 in the actuator 5, acting through the plunger 14, displaces the oil from the chamber 23 back into the space vacated by the piston 48.

As both the hand pump 7 and the intensifier 8 operate on the basis of a direct displacement of oil first in one direction and then the other and neither affects the operation of the other, each can be operated independently without valving between them to supply operating fluid to the actuator 5 through the common lead 12. In the illustrated embodiment in which the coupler 2 is mounted in a draft arm 3, portions of the branches 11 and the common lead 12 can be a rigid T 61 anchored to the draft arm and connected at its ends by flexible armored hose to the actuator 5, the hand pump 7 and the intensifier 8. Although the uncoupling mechanism 1 preferably has both the manual operating device 7 and the automatic operating device 8, the former can be dispensed with, if, as in the illustrated embodiment, provision is made for direct mechanical operation of the rotor 6 to unlock the coupler 2 when a source of power is unavailable. Conversely, the mechanism, with only the manual operating device 7, can be used in place of a conventional lock operating rod and is of particular advantage when, as in the illustrated embodiment, the extended movements of the coupler 2 would otherwise require a cumbersome and complicated compound operating rod.

From the above detailed description it will be apparent that there has been provided a fluid-operated uncoupling mechanism which is selectively operable manually or automatically and in its preferred form has adequate safeguards against breakdowns. It should be understood that the described and disclosed embodiment is merely exemplary of the invention and that all modifications are intended to be included that do not depart from the spirit of the invention and the scope of the appended claims.

What is claimed is:

1. A fluid-operated uncoupling mechanism for an automatic railway coupler, comprising fluid-operated actuator means mounted on said coupler and mechanically connected to a lock thereof, said actuator means in the absence of fluid pressure thereon restraining said lock against movement in an unlocking direction and in response to fluid pressure moving said lock to unlock said coupler, and operating means fluid-connected to said actuator means for applying said fluid pressure thereto.

2. A fluid-operated uncoupling mechanism for an automatic railway coupler, comprising fluid-operated actuator means mounted on said coupler and mechanically connected to a lock thereof, said actuator means in the absence of fluid pressure thereon restraining said lock against movement in an unlocking direction and in response to fluid pressure moving said lock to unlock said coupler, and automatic and manual operating means fluid-connected to said actuator means for alternately applying said fluid pressure thereto.

3. A fluid-operated uncoupling mechanism for an automatic railway coupler, comprising fluid-operated actuator means mounted on said coupler and operatively connected to a lock thereof, said actuator means in the absence of fluid pressure thereon restraining said lock against movement in an unlocking direction and in response to fluid pressure moving said lock to unlock said coupler, and operating means fluid-connected to said actuator means for applying said fluid pressure thereto.

4. A fluid-operated uncoupling mechanism for an automatic railway coupler, comprising fluid-operated actuator means mounted on said coupler and operatively connected to a lock thereof, said actuator means in the absence of fluid pressure thereon restraining said lock against movement in an unlocking direction and in response to fluid pressure moving said lock to unlock said coupler, and independently operable automatic and manual operating means fluid-connected through a common lead line to said actuator means for selectively applying said fluid pressure thereto.

5. A liquid-operated uncoupling mechanism for an automatic railway coupler, comprising liquid-operated actuator means mounted on said coupler and operatively connected to a lock thereof, said actuator means in the absence of liquid pressure thereon restraining said lock against movement in an unlocking direction and in response to fluid pressure moving said lock to unlock said coupler, and independently operable automatic and manual operating means liquid-connected through a common lead line to said actuator means for selectively applying said liquid pressure thereto.

6. A liquid-operated uncoupling mechanism for an automatic railway coupler, comprising actuator means mounted on said coupler and connected to a lock thereof, said actuator means in response to liquid pressure thereon being adapted to unlock said coupler by moving said lock to unlocking position, and manual operating means liquid-connected to said actuator means for applying said liquid pressure thereto.

7. A liquid operated uncoupling mechanism for an automatic railway coupler, comprising actuator means mounted on said coupler and connected to a lock thereof, said actuator means in response to liquid pressure thereon being adapted to unlock said coupler by moving said lock to unlocking position, and independently operable manual and automatic operating means liquid-connected to said actuator means for selectively applying said liquid pressure thereto.

8. A liquid operated uncoupling mechanism for an automatic railway coupler, comprising actuator means mounted on said coupler and connected to a lock thereof, said actuator means in response to liquid pressure thereon being adapted to unlock said coupler by moving said lock to unlocking position, and valve-controlled automatic operating means powered by compressed air for applying said liquid pressure to said actuator means.

9. A liquid operated uncoupling mechanism for an automatic railway coupler, comprising actuator means mounted on said coupler and connected to a lock thereof, said actuator means in response to liquid pressure thereon being adapted to unlock said coupler by moving said lock to unlocking position, and a hand pump liquid-connected to said actuator means for applying said liquid pressure thereto.

10. A liquid operated uncoupling mechanism for an automatic railway coupler, comprising actuator means mounted on said coupler and connected to a lock thereof, said actuator means in response to liquid pressure thereon being adapted to unlock said coupler by moving said lock to unlocking position, valve-controlled automatic operating means powered by compressed air, and a hand pump, said automatic operating means and hand pump being

liquid-connected to said actuator means and selectively operable for applying said liquid pressure thereto.

11. A liquid operated uncoupling mechanism for an automatic railway coupler, comprising liquid-operated actuator means mounted on said coupler and mechanically connected to a lock thereof, said actuator means in the absence of liquid pressure thereon yieldably resisting movement of said lock to unlocking position and on application of liquid pressure thereto being adapted to uncoupling said coupler by moving said lock to unlocking position, valve-controlled automatic operating means powered by compressed air, and a hand pump, said automatic operating means and hand pump being liquid-connected to said actuator means and selectively operable for applying said liquid pressure thereto.

12. A fluid-operated uncoupling mechanism for a rotor-operated knuckle coupler, comprising a fluid-operated actuator mounted on said coupler, said actuator including a housing receiving a part of a rotor of said coupler, and a plunger reciprocable in said housing and drivably connected to said rotor and responsive to applied fluid pressure for rotating said rotor in a direction to unlock said coupler, and operating means fluid-connected to said actuator for applying said fluid pressure thereto.

13. A fluid-operated uncoupling mechanism for a rotor-operated knuckle coupler, comprising a fluid-operated actuator mounted on said coupler, said actuator including a housing receiving a part of a rotor of said coupler, and a plunger reciprocable in said housing and rack-and-pinion connected to said rotor and responsive to applied fluid pressure for driving said rotor in a direction to unlock said coupler, and operating means fluid-connected to said actuator for applying said fluid pressure thereto.

14. A fluid-operated uncoupling mechanism for a rotor-operated knuckle coupler, comprising a fluid-operated actuator mounted on said coupler, said actuator including a housing receiving a part of a rotor of said coupler, a plunger reciprocable in said housing and rack-and-pinion connected to said rotor, said plunger in an advance stroke in response to fluid pressure applied thereto turning said rotor in a direction to unlock said coupler, and return spring means in said housing and acting therebetween and said plunger for yieldably resisting said advance stroke thereof and normally locking said rotor against turning to unlock said coupler, and automatic and manual operating means fluid-connected to said actuator means for selectively applying said fluid pressure to said plunger.

15. A fluid-operated uncoupling mechanism for a rotor-operated knuckle coupler, comprising an actuator mounted on said coupler, said actuator including a housing, a plunger reciprocable in said housing, and having a body and a head connected for axial movement both in unison and relatively, said body being rack-and-pinion connected to a part of a rotor of said coupler projecting substantially normal thereto into said housing, said body in response to fluid pressure applied to said head moving in unison therewith in an advance stroke for turning said rotor in a direction to unlock said coupler, a return spring in said housing and acting therebetween and said body for yieldably resisting the advance stroke thereof both in unison with and independently of said head, said relative movement of said body and head and cooperating means on said rotor permitting direct turning of said rotor in a direction to unlock said coupler against the resistance of said spring and without moving said head, and operating means fluid-connected to said actuator for applying said fluid pressure to said head.

16. A fluid-operated uncoupling mechanism for a rotor-operated knuckle coupler, comprising an actuator mounted on said coupler, said actuator including a housing, a plunger reciprocable in said housing, and having a body and a head connected for axial movement both in unison and relatively, said body being rack-and-pinion connected to a part of a rotor of said coupler projecting substantially normal thereto into said housing, said body in response to fluid pressure applied to said head moving in unison therewith in an advance stroke for turning said rotor in a direction to unlock said coupler, a return spring in said housing and acting therebetween and said body for yieldably resisting the advance stroke thereof both in unison with and independently of said head, said relative movement of said body and head and cooperating means on said rotor permitting direct turning of said rotor in a direction to unlock said coupler against the resistance of said spring and without moving said head, and manual and automatic operating means fluid-connected to said actuator for selectively applying said fluid pressure to said head.

17. A liquid-operated uncoupling mechanism for an automatic railway coupler, comprising a liquid-operated actuator mounted on said coupler and mechanically connected to a lock thereof, said actuator in the absence of liquid pressure thereon yieldably resisting movement of said lock to unlocking position and on application of liquid pressure thereto moving said lock to said unlocking position, and a hand pump liquid-connected to said actuator and operable in a single stroke to move said lock to unlocking position by applying said liquid pressure to said actuator.

18. A liquid-operated uncoupling mechanism for an automatic railway coupler, comprising a liquid-operated actuator mounted on said coupler and mechanically connected to a lock thereof, said actuator in the absence of liquid pressure thereon yieldably resisting movement of said lock to unlocking position and on application of liquid pressure thereto moving said lock to said unlocking position, a hand pump liquid-connected to said actuator and operable to move said lock to unlocking position by applying said liquid pressure to said actuator, and an intensifier powered by compressed air and controlled by a solenoid-actuated valve, said intensifier being fluid-connected to said actuator and selectively operable independently of said pump for unlocking said coupler by applying said liquid pressure to said actuator.

References Cited by the Examiner

UNITED STATES PATENTS

620,558	3/1899	Addis	213—212
746,838	12/1903	Hone	213—212
1,507,036	9/1924	Van Dorn	213—212
2,290,476	7/1942	Larsson	213—212
2,891,683	6/1959	Edmunds	213—212

ARTHUR L. LA POINT, *Primary Examiner.*

B. FAUST, *Assistant Examiner.*